MATHEMATICS-IX

Module -6

INDEX

CIRCLES

IMPORTANT POINTS

1. Equal chords of a circle subtend equal angles at the centre

Given. Chord AB = chord CD in a circle with centre O.
To prove. $\angle AOB = \angle COD$

2. Conversely, if the angles subtended by the chords at the centre of a circle are equal, then the chord are equal.
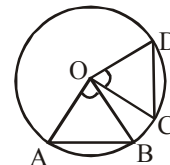
Given : Two chords AB and CD subtend equal angles $\angle AOB$ and $\angle COD$ at the centre O.
To prove AB = CD

3. The perpendicular from the centre of a circle to a chord bisects the chord.
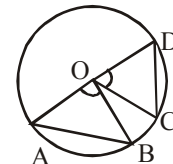
Given : OC is perpendicular to a chord AB in a circle with centre O.
To prove. AC = CB

4. Conversely, the line drawn through the centre of a circle to bisect a chord is perpendicular to the chord.

Given : AB is a chord and C is the mid point of AB. O is the centre of the circle.
To prove. OC is $\perp$ to AB

5. There is one and only one circle passing through three given non-collinear points.

Given : There are three non collinear points A,B and C.
To prove. Only one circle will pass through the points A, B and C.

6. Equal chords of a circle (or of congruent circles) are equidistant from the centre.

Given : Two chords AB and CD are equal in a circle with centre O.
To prove. OM $\perp$ AB = ON $\perp$ CD

7. Conversely, chords of a circle (or of congruent circles) that are equidistant from the centre are equal.

Given : Two chords AB and CD are equidistant from the centre O of a circle, i.e., OM $\perp$ AB = ON $\perp$ CD.
To prove. AB = CD

8. The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.

Given : Let $\overset{\frown}{AB}$ an arc in a circle with centre O and there is a point C in the alternate segment.
To prove $\angle AOB = 2\angle ACB$

9. Angles in the same segment of a circle are equal.

Given : Two angles $\angle ACB$ and $\angle ADB$ subtended in the same segment AB.
To prove $\angle ACB = \angle ADB$.

10. If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the segment, the four points lie on a circle.
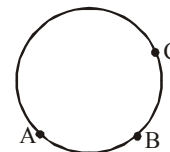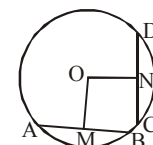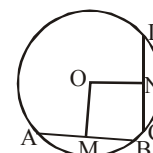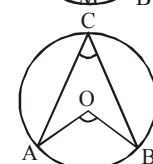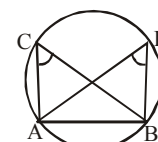
Given Two angles $\angle ACB$ and $\angle ADB$ are subtended by the line segment AB are equal $\angle ACB = \angle ADB$.
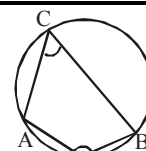**To prove.** A,B,C,D lie on a circle.

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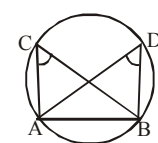
11.	The sum of the either pair of the opposite angles of a cyclic quadrilateral is 180°.	**Given.** $\angle ACB$ and $\angle ADB$ are in the alternate segments of a circle. **To prove.** $\angle ACB + \angle ADB = 180º$	
12.	If a pair of opposite angles of a quadrilateral is supplementary then the quadrilateral is cyclic.	**Given.** The sum of the angles in the alternate segments is 180 i.e., $\angle ABC + \angle ADC = 180°$. **To prove.** A, B, C, D is a cyclic quadrilateral.	

Properties :

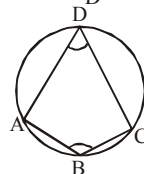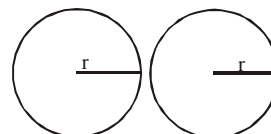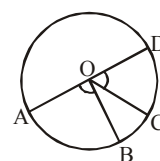| 13.	Two circles are congruent, if and only if they have equal radii	**Given.** Two circles of equal radii. **To prove.** Given circles are congruent.	
14.	Two arcs of a circle are congruent if the angles subtended by them at the centre are equal.	**Given.** Two arcs $\overarc{AB}$ and $\overarc{CD}$ subtend equal angles $\angle AOB$ and $\angle COD$. **To prove.** Arcs $\overarc{AB}$ and $\overarc{CD}$ are congruent.	
15.	Converse : Two arcs subtend equal angles at the centre, if the arcs are congruent.	**Given.** Two arcs $\overarc{AB}$ and $\overarc{CD}$ are congruent in a circle with centre O. **To prove.** $\angle AOB = \angle COD$	
16.	If two arcs of a circle are congruent, their corresponding chords are equal.	**Given.** Two arcs $\overarc{AB}$ and $\overarc{CD}$ are congruent in a circle. **To prove.** chord AB = chord CD	
17.	**Converse**. If two chords of a circle are equal , their corresponding arcs are equal.	**Given.** Two chords AB and CD are equal in a circle. **To prove.** $\overarc{AB} = \overarc{CD}$	
18.	The angle in a semi-circle is a right angle.	**Given.** ABC is a semi circle with centre O. **To prove.** $\angle ACB = 90°$	
19.	**Converse.** The arc of a circle subtending a right angle at any point of the circle in its alternate segment is a semicircle.	**Given.** $\angle ACB = 90°$ **To prove.** $\overarc{ACB}$ is a semicircle	
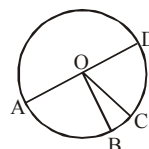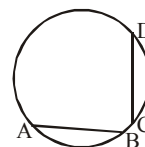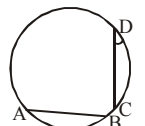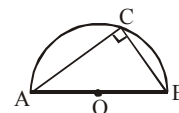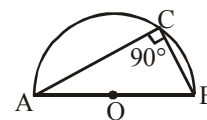
IMPORTANT TERMS

1. **Circle.** A circle is a collection of all those points in a plane that are at a given constant distance from a given fixed point in the plane.
2. **Centre.** The fixed point is called the centre of the circle. In the figure O is the centre.
3. **Radius.** The constant distance from its centre is called the radius of the circle. In the figure, OA is radius-

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4.   Chord. A line segment joining two points on a circle is called a chord of the circle. In the figure, AB is a chord of the circle.

5.   Diameter. A chord passing through the centre of a circle is called the diameter of the circle. A circle has an infinite number of diameters. CD is the diameter of the circle as shown in the figure. If d is the diameter of the circle then d = 2r. where r is the radius.
In the figure, AB is the diameter and the arcs $\overset{\frown}{CD}$ and $\overset{\frown}{DC}$ are semicircles.
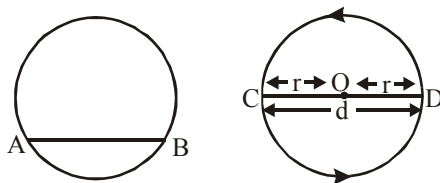
6.   Arc. A continuous piece of a circle is called an arc. Let A,B,C,D,E,F be the points on the circle. The circle is divided into different pieces. Then, the pieces AB, BC, CD, DE, EF etc. are all arcs of the circle.
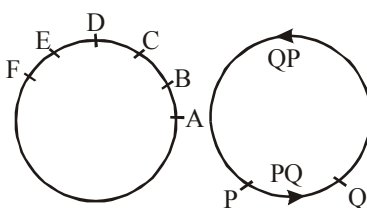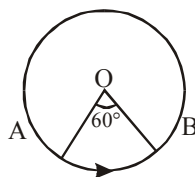

Let P,Q be two points on the circle. These P, Q divide the circle into two parts. Each part is an arc. These arcs are denoted in anti-clockwise direction from P to Q as $\overset{\frown}{PQ}$ and form Q to P as $\overset{\frown}{QP}$. The counter clockwise direction distinguishes between these two arcs $\overset{\frown}{PQ}$ and $\overset{\frown}{QP}$. The length of arc $\overset{\frown}{PQ}$ can be less than, equal to or greater than the length of the arc $\overset{\frown}{QP}$

i.e., (i) $\ell(\overset{\frown}{PQ}) < \ell(\overset{\frown}{QP})$ (ii) $\ell(\overset{\frown}{PQ}) = \ell(\overset{\frown}{QP})$ (iii) $\ell(\overset{\frown}{PQ}) > \ell(\overset{\frown}{QP})$

when $\ell(\overset{\frown}{PQ}) < \ell(\overset{\frown}{QP})$, then the arc $(\overset{\frown}{PQ})$ is called a minor arc.

And when $\ell(\overset{\frown}{PQ}) > \ell(\overset{\frown}{QP})$, then the arc $\overset{\frown}{PQ}$ is called a major arc.

7.   Circumference of a circle. The perimeter of a circle is called its circumference. The circumference of a circle of radius r is $2\pi r$.

8.   Segment. Let AB be a chord of the circle. Then, AB divides the region enclosed by the circle (i.e., the circular disc) into two parts. Each of the parts is called a segment of the circle. The segment, containing the minor arc is called minor segment and the segment, containing the major arc, is called the major segment.
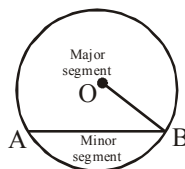
9.   Central Angles. Consider a circle. The angle subtended by an arc at the centre O is called the central angle. The vertex of the central angle is always at the centre O. **Degree measure of an arc :** Degree measure of a minor arc is the measure of the central angle subtended by the arc.

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In the figure, the measure of the arc $\overarc{AB}$ is 60° i.e., m $\overarc{AB}$ = 60°. The measure of a major arc is 360° – the degree measure of the corresponding minor arc. The degree measure of the major arc is 360° – 60° = 300°
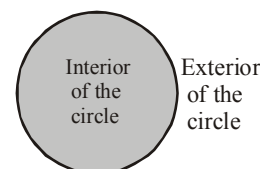
∴ m$\overarc{BA}$ = 300°.

The degree measure of the circumference of the circle is always 360°.

10. **Interior and Exterior of Circle.**

   A circle divides the plane on which lies into three parts.

   (i) Inside the circle which is called the interior of the circle

   (ii) Circle

   (iii) Outside the circle, which is called the exterior of the circle.

   The circle and its interior make up the circular region.

11. **Sector :**

   A sector is that region of a circular disc which lies between an arc and the two radii joining the extremities of the arc and the centre. OAB is a sector as shown in the figure.
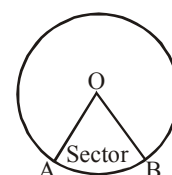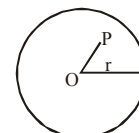
   Quadrant. One fourth of a circular disc is **called a quadrant**.

12. **Position of a point :**

   Point Inside the circle. A point P, such that OP < r, is said to lie inside the circle. The point inside the circle is also called interior point.

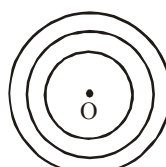   **Point outside the circle,** A point Q, such that OQ > r, is said to lie outside the circle

   The point outside the circle is also called exterior point.

   Point on the circle. A point S, such that OS = r is said to lie on the circle

13. **Concentric Circles**.

   Circles having the same centre are said to be concentric circles.

   Concentric Circles

   Remark. The word 'radius' is used for a line segment joining the centre to any point on the circle and also for its length.

14. **Congruence of Circles & Arcs**

   Congruent circles. Two circles are said to be congruent if and only if, one of them can be superposed on the other, so as the cover it exactly. It means two circles are congruent if and only if, their radii are equal. i.e., C (O, r) and C (O' , s) are congruent if only if r = s.
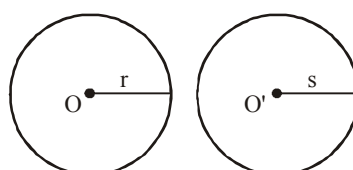
   Congruent circles if r = s

   Congruent arcs : Two arcs of a circle are congruent, if either of them can be superposed on the other, so as to cover it exactly. It is only possible, if degree measure of two arcs are the same.

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SUMMARY OF THE CHAPTER

**1.   Introduction**

We all are familiar with the shape of a circle. A bangle, a ring , a coin, wheels of a vehicle, a CD, button of a shirt, striker of carom, the path followed by merry-go-round and many more objects which we see around us are examples of a circle.

In the present chapter, we shall study a circle mathematically i.e., the precise definition of a circle, the terms related to a circle like chord, arc, segment, sector, we shall also study the properties related to chords and arcs of a circle and a quadrilateral inscribed in a circle that is cyclic quadrilateral.

2.   CIRCLE AND TERMS RELATED TO A CIRCLE

Circle. The path traced by a point which moves in such a way that it always remains at a fixed (given) distance from a fixed (given) point.
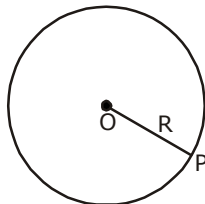
The fixed point is called the centre and the fixed distance between fixed point (centre) and the moving point is called the radius of the circle.

In the adjacent figure, O is the centre of circle and the moving point P such that OP = r, traces a circle with OP = r, as radius of the circle. Thus, we can state that -

"Radius of a circle is the length of line segment which is obtained by joining the centre of the circle to any point on the circle."

A circle divides the plane, in which it lies, in the following three regions.

(i) Interior region. This is the region formed by the points which lie inside the circle. For any point P lying in the interior region PC < radius , where C is the centre of the circle.

(ii) Boundary. It is formed by the points which lie exactly on the circle. For any point Q lying on exactly on the circle. For any point Q lying on the boundary CQ = radius of circle, where C is the centre of circle the length of this complete boundary is also called the perimeter of circumference of the circle. If r is the radius of the circle then its circumference = $2\pi r$.

(iii) Exterior region. This region is formed by the points which lie outside the circle. For any point R lying outside the circle, CR > radius of circle where C is the centre of the circle.
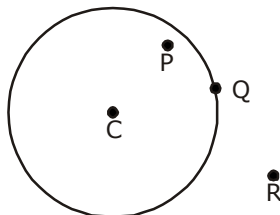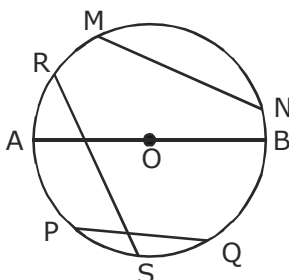

"The boundary and interior region of a circle together form the circular region."

In the above figure point P lies in the interior region of circle, point Q lies on the boundary of the circle and point R lies in the exterior region of the circle.

3.   CHORD OF A CIRCLE   A chord of a circle is a line segment joining any two points on the boundary of circle.

In the given figure MN, AB, PQ and RS are the chords of circle with centre O. Clearly, there can be infinite many chords of a given circle.

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Diameter. The chord of a circle which passes through centre is called the diameter of the circle. It is in fact the longest chord of the circle and its length is equal to double the radius of the circle, i.e.,
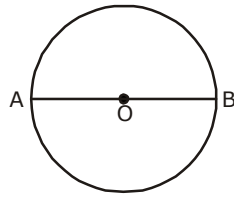

diameter = 2 × radius.

In the given figure AB is the diameter of the circle.

Secant. A line intersecting a circle at two distinct points is called a secant of the circle. In the adjacent figure line l meets the circle at two distinct points A and B so l is a secant of the circle.
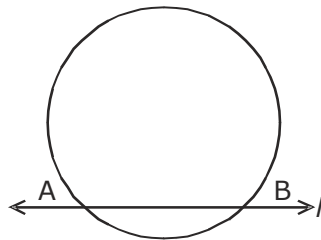
Tangent. A line that meets the circle exactly at one point is called a tangent of the circle and the point where it meets the circle is called the point of contact.
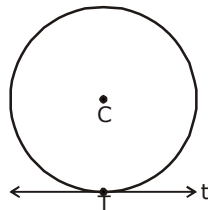

In the given figure, line t is a tangent to the circle with centre C and T is the point of contact.

4. ARCS OF A CIRCLE

"The part of boundary of a circle between any two points on the circle is called an arc of the circle."
In fact, there are two parts of the boundary of a circle between any two points on the circle, out of which one is smaller and other is larger. The smaller part is called minor arc of the circle and the longer part is called the major arc of the circle.

In the adjacent figure point P and Q, on the boundary of circle, divide it into two parts-one with dotted line and other with continuous line.
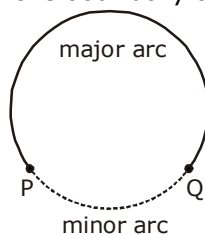
The dotted part is minor arc PQ and the continuous part is the major arc PQ. In general 'arc PQ' or $\overarc{PQ}$ stand for minor arc unless otherwise stated.
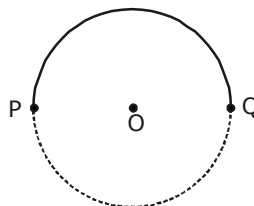

When P and Q divide the circle into two equal parts then each arc is called a semicircle. Clearly in this case P and Q are the extremities of the diameter of the circle.

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5. SEGMENT OF A CIRCLE

A chord of a circle divides its interior region into two parts. Each of such part is called a segment of a circle. Clearly it is the region bounded by a chord and an arc of a circle.
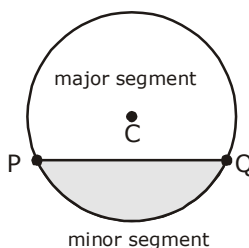
Depending upon the types of arcs, minor or major, two types of segments are there-
The region between chord PQ and major arc PQ is called major segment whereas the region between chord PQ and minor arc PQ is called minor segment.
Minor and major segment of a circle are called alternate segments.
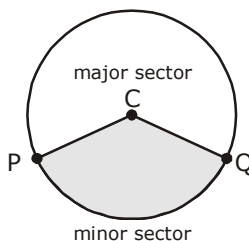
Unless otherwise stated, by segment of a circle we mean minor segment.
Note. It should be noted here that when circle is divided into two parts by a chord then the part containing the center is the major segment and the other part is the minor segment.
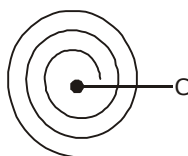
6. SECTORS OF A CIRCLE

The region bounded by an arc and the two radii, joining the centre to the end points of the arc is called a sector. The sector formed with minor arc and two radii is called minor sector and the sector formed with major arc and two radii is called major sector.

In the figure given, shaded region represents minor sector of the circle. Like segments, unless otherwise stated, a sector means a minor sector.

If the two radii form a diameter of circle or $\overparen{PQ}$ is a semicircular arc then circle is divided into two equal sectors. In this case, sectors and segments become same and each is called a semicircular region. If two radii are perpendicular to each other then sector of a circle is called a quadrant of the circle. (One fourth part of circle).

7. CONCENTRIC CIRCLES

Two or more circles are said to be concentric if they have same centre but different radii. In the adjacent figure concentric circles with common centre C are shown.

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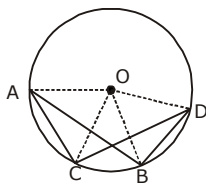9810934436 , 8076575278 , 8700391727

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SOLVED PROBLEMS

Ex.1 In the given figure, AB and CD are two equal chords of a circle with centre O. Prove that AC = BD.
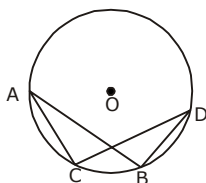
Sol. Let us join OA, OB, OC, OD.

$\because$ AB = CD $\therefore$ $\angle AOB = \angle COD$

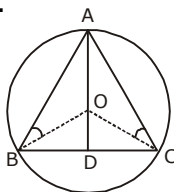($\because$ equal chords subtend equal angles at the centre)

$\Rightarrow$ $\angle AOB - \angle BOC = \angle COD - \angle BOC$

(subtracting $\angle BOC$ from both sides)

$\Rightarrow$ $\angle AOC = \angle BOD$ $\therefore$ AC = BD

($\because$ if angles subtended by two chords at the centre are equal then chords are also equal.)

Ex.2 Let O be the centre of circle passing through A, B and C. If bisector AD of $\angle BAC$ passes through O, Prove that $\triangle ABC$ is an isosceles triangle.

Sol. Let us join OB and OC.

In $\triangle AOB$, OA = OB

(radii of same circle)

$\therefore$ $\angle OAB = \angle OBA$ ...(1)

Similarly in $\triangle AOC$, we can prove that

      $\angle OAC = \angle OCA$ ...(2)

But, $\angle OAB = \angle OAC$ ...(3)

($\because$ AD bisects $\angle A$)

From equations (1), (2) and (3) we get

      $\angle OBA = \angle OCA$

Now in $\triangle AOB$ and $\triangle AOC$,

      $\angle OBA = \angle OCA$ (proved above)

      $\angle OAB = \angle OAC$ ($\because$ AD bisects $\angle A$)

      AO = AO (common)

$\therefore$ $\triangle AOB \cong \triangle AOC$

   (by AAS congruence condition) $\therefore$ AB = AC (by cpct)

 or the $\triangle ABC$ is an isosceles triangle.

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Ex.3 If two circle intersect at two points, prove that their centres lie on the perpendicular bisector of the common chord.   **[NCERT]**

Sol. Let us consider two circles, with centres C and D, intersecting each other at AB, AB is the common chord of two circles.
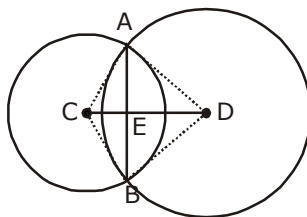
Let us join CD, intersecting AB at E. In order to prove the required result it is sufficient to prove that CD bisects AB at E and CD ⊥ AB. Let us join AC, BC, AD and BD.

In triangles ACD and BCD,

AC   = BC (radii of same circle)

AD   = BD (radii of same circle)

CD   = CD (common)

∴ ΔACD ≅ ΔBCD (by SSS congruence condition)

∴   ∠ACD = ∠BCD (cpct)

and   ∠ADC = ∠BDC (cpct)

Now in ΔACE and ΔBCE

        AC   = BC (radii of same circle)

        ∠ACE = ∠BCE (proved above)

        CE   = CE (common)

∴   ΔACE ≅ ΔBCE

        (by SAS congruence condition)

∴   AE = EB (cpct)   ....(1)

and   ∠AEC = ∠BEC (cpct)

But, ∠AEC + ∠BEC = 180º (linear pair)

∴   ∠AEC + ∠AEC = 180º

⟹   2 ∠AEC = 180º

⟹   ∠AEC = 90º   ....(2)

Hence from equations (1) and (2) CE is perpendicular to AB and CE bisects AB.

∴ CD is perpendicular bisector of AB.

Ex.4 Two circle of radii 10cm and 8cm intersect each other so that the length of common chord is 12cm. Find the distance between the centres of the circles.   **[NCERT]**

Sol. Let the two circle with centres C and D respectively intersect each other at A and B so that AB is the common chord.

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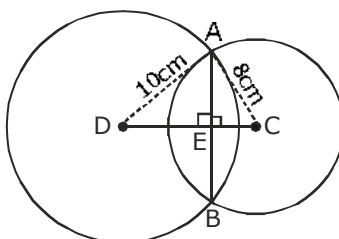
We know that the line joining the centres of the two circles bisects the common chord perpendicularly.

$$\therefore \qquad AE = \frac{1}{2}\ AB = \frac{1}{2} \times 12 = 6cm$$

and $\qquad \angle AEC = \angle AED = 90º$

In $\triangle ACE$, on applying Pythagoras theorem, we get

$$AC^2 = AE^2 + CE^2$$

$\Rightarrow \qquad 10^2 = 6^2 + CE^2$

$\Rightarrow \qquad CE^2 = 100 - 36 = 64$

$\Rightarrow \qquad CE = 8cm$

Also in $\triangle AED$, on applying Pythagoras theorem, we get

$$AD^2 = AE^2 + ED^2$$
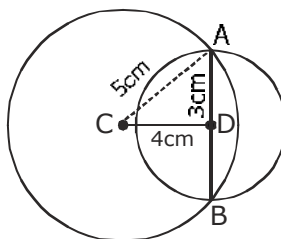
$\Rightarrow \qquad 8^2 = 6^2 + ED^2$

$\Rightarrow \qquad ED^2 = 64 - 36 = 28$

$\Rightarrow \qquad ED = 2\sqrt{7} = 5.29\ cm$

$\therefore \qquad CD = CE + ED = (8 + 5.29) = 13.29cm.$

Ex.5 Two circles of radii 5cm and 3cm intersect at two points and the distance between their centres is 4 cm. Find the length of the common chord. **[NCERT]**

Sol. Let the two circles with centres C and D intersect each other at A and B so that AB is the common chord.

Given that radius of bigger circle = AC = 5cm.

Given that radius of smaller circle = AD = 3cm and distance between centres = CD = 4cm

Here we observe that, $5^2 = 3^2 + 4^2$

i.e., $\qquad AC^2 = AD^2 + CD^2$

$\Rightarrow \qquad \angle ADC = 90º$

(by converse of Pythagoras theorem)

Which is possible only when D lies on AB. Also the line joining the centres of two intersecting circles bisects the common chord perpendicularly,

$\therefore \qquad$ D is the mid point of AB

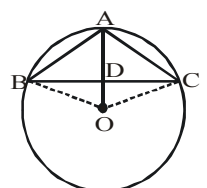$\Rightarrow \qquad AB = 2AD = 2 \times 3 = 6cm$

Hence the length of common chord is 6cm

Ex.6 In figure, $\overset{\frown}{AB} \cong \overset{\frown}{AC}$ and O is the centre of the circle. Prove that OA is the perpendicular bisector of BC.

Sol. **Given :** $\overset{\frown}{AB} \cong \overset{\frown}{AC}$ and O is the centre of the circle.
To prove : OA is the perpendicular bisector of BC.
Construction : Join OB and OC.

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Proof : $\overline{AB} \cong \overset{\frown}{AC}$ [Given]

∴ chord AB = chord AC

[∵ if two arcs of a circle are congruent, then their corresponding chords are equal]

∴ ∠AOB = ∠AOC   ... (i) [∵ Equal chords of a circle subtend equal angles at the centre]

In   ΔOBD = ΔOCD,

          ∠DOB = ∠DOC   [From (i)]

          OB = OC   [Radii of the same circle]

          OD = OD   [Common]

∴   ΔOBD ≅ ΔOCD   [By SAS]

∴   ∠ODB = ∠ODC   [By C.P.C.T.]

          BD = CD   [By C.P.C.T.]

But   ∠BDC = 180°   [BDC is a straight line]

∴   ∠ODB + ∠ODC = 180°

⇒   ∠ODB + ∠ODB = 180°[Proved earlier ∠ODB = ∠ODC]

⇒   2∠ODB = 180°

⇒   ∠ODB = 90°

⇒   ∠ODB = ∠ODC = 90°

⇒   OA is the perpendicular bisector of BC. Hence proved

Ex.7 In the adjacent figure AB is diameter of circle with centre O and CD is a chord. AB and CD when produced meet each other at E. Find the value of x.
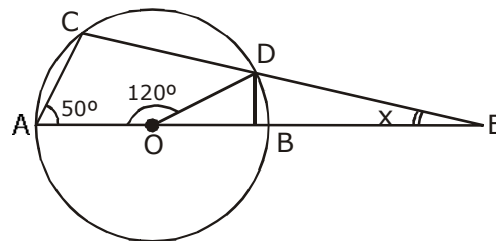
Sol.   Arc AD subtends an angle AOD at centre and ∠ABD in the remaining part of the circle.

∴   ∠AOD = 2 ∠ABD

(∵ the angle subtended by an arc at centre of a circle is double the angle subtended by it in the remaining part of the circle).

∴ $\angle ABD = \frac{1}{2} \times 120º = 60º$

But ∠ABD + ∠EBD = 180º (linear pari)

⇒   60º + ∠EBD = 180º

⇒   ∠EBD = 120º

Also   ∠BDE = ∠BAC

(Exterior angle property of a cyclic quadrilateral)

∴   ∠BDE = 50º

Now in ΔBDE, by angle sum property we have

          ∠BDE + ∠DBE = 180º   ⇒   50º + 120º + x = 180º   ⇒   x = 180º -170º = 10º

          Hence x = 10º

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Ex.8 In a figure, If a line intersects two concentric (circle with the same centre) with centre O at A, B, C and D. Prove that AB = CD **[NCERT]**
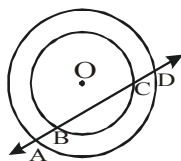
Sol. **Given :** A line intersects two concentric circles (circles with the same centre)

with centre O at A, B, C and D

To prove : AB = CD

Construction : Draw OM $\perp$ BC.

Proof : The perpendicular drawn from the centre of a circle to a chord bisects the chord.

$\therefore$ AM = DM   ... (1)
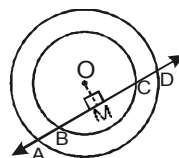
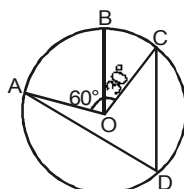BM = CM   ... (2)

Subtracting (2) from (1), we get

AM – BM = DM – CM

$\Rightarrow$ AB = CD.

Hence Proved

Ex.9 In figure, A, B and C are three points on a circle with centre O such that $\angle BOC = 30°$ and $\angle AOB = 60°$. If D is a point on the circle other than the arc ABC, find $\angle ADC$. **[NCERT]**
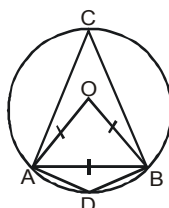

Sol. $\angle ADC = \dfrac{1}{2} \angle AOC$ [The angle substended by an arc at the centre is double the angle subtended by it any point on the remaining part of the circle]

$= \dfrac{1}{2} (\angle AOB + \angle BOC)$

$= \dfrac{1}{2} (60° + 30°)$

$= \dfrac{1}{2} (90°) = 45°$

Ex.10 A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc. **[NCERT]**

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Sol. ∵   OA = OB = AB [Given]

∴   ΔOAB is equilateral

∴   ∠AOB = 60°

$$\angle ACB = \frac{1}{2} \angle AOB$$

[The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle]

$$= \frac{1}{2} \times 60 = 30°$$

∵ ADBC is a cyclic quadrilateral.

∴   ∠ADB + ∠ACB = 180°

[The sum of either pair of opposite angles of a cyclic quadrilateral is 180°]

⇒   ∠ADB + 30° = 180°

⇒   ∠ADB = 180° − 30°

⇒   ∠ADB = 150°

Ex.11 In figure, ∠PQR = 100°, where P, Q and R are points on a circle with centre O. Find ∠OPR. **[NCERT]**
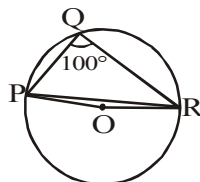
Sol. Take a point S in the major arc. Join PS and RS.
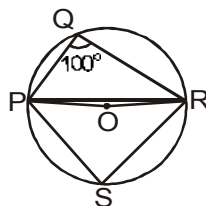
∵   PQRS is a cyclic quarilateral.

∴   ∠PQR + ∠PSR = 180°

[The sum of either pair of opposite angles of a cyclic quadrilateral is 180°]

⇒   100° + ∠PSR = 180°

⇒   ∠PSR = 180° − 100°

⇒   ∠PSR = 80°   ...(1)

Now ∠PSR = 2∠PSR   [The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle]

= 2 × 80° = 160°   ... (2)   [Using (i)]

In ΔOPR,

∵   OP = OR   [radii of a circle]

∴   ∠OPR = ∠ORP   ... (3)

[Angles opposite to equal sides of a triangle is 180°]

In   ΔOPR,   [Sum of all the angles of a triangle is 180°]

⇒   ∠OPR + ∠ORP + ∠POR = 180°∠OPR + ∠OPR +   [Using (2) and (1)]

⇒   160° = 180°2∠OPR + 160° = 180°

⇒   2∠OPR = 180° − 160° = 20°∠OPR = 10°

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Ex.12 In figure, A, B, C and D are four points on a circle. AC and BD intersect at a point E such that ∠BEC = 130° and ∠ECD = 20°. Find ∠BAC. **[NCERT]**
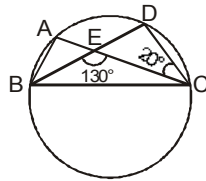
Sol. ∠CED + ∠BEC = 180° [Linear Pair]

⇒   ∠CED + 130° = 180°

⇒   ∠CED + 180° − 130° = 50°   ...(i)

         ∠ECD = 20°   ...(ii)

In   ΔCED,

∠CED + ∠ECD + ∠CDE = 180°

[Sum of all the angles of a triangle is 180°]

⇒   50° + 20° + ∠CDE = 180°

                        [Using (i) and (ii)]

⇒   70° + ∠CDE = 180°

⇒   ∠CDE = 180° − 70°

⇒   ∠CDE = 110°   ...(iii)

Now ∠BAC = ∠CDE = 110°

[Angle in the same segment of a circle are equal]

Ex.13 ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. If ∠DBC = 70°, ∠BAC is 30°, find ∠BCD. Further, if AB = BC, find ∠ECD. **[NCERT]**

Sol. ∠CDB = ∠BAC = 30°   ...(i)

[Angles in the same segment of a circle are equal]

∠DBC = 70°   ...(ii)

In ΔBCD,
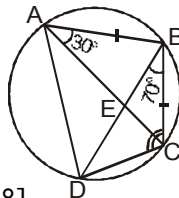
∠BCD + ∠DBC + ∠CDB = 180°

[Sum of all the angles of a triangle is 180°]

⇒   ∠BCD + 70° + 30° = 180°

[Using (i) and (ii)]

⇒   ∠BCD + 100° = 180°

⇒   ∠BCD = 180° − 100°

⇒   ∠BCD = 80°   ...(iii)

In   ΔABC,

         AB = BC

∴   ∠BCA = ∠BAC = 30°   [Angle opposite to equal sides of a triangle are equal]   ...(iv)

         [∵ ∠BAC = 30° (given)]

Now   ∠BCD = 80°   [From (iii)]

⇒   ∠BCA + ∠ECD = 80°

⇒   30° + ∠ECD = 80°

⇒   ∠ECD = 80° − 30°

⇒   ∠ECD = 50°

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Ex.14 If the non-paralle side of a trapezium are equal prove that it is cyclic. **[NCERT]**

Sol. **Given :** ABCD is a trapezium whose two non-parallel sides AD and BC are equal.

To Prove : Trapezium ABCD is a cyclic.

Construction : Draw BE∥AD

Proof : ∵ AB∥DE   [Given]

       AD∥BE   [By construction]

∴ Quadrilateral ABCD is a parallelogram.

∴ $\angle BAD = \angle BED$ ...(i)

        [Opp. ∠s of a ∥ gm]

and   AD = BE   ...(ii)

        [Opp. sides of a ∥ gm]

But   AD = BC   ...(iii)

        [Given]

From (ii) and (iii)

      BE = BC

∴ $\angle BEC = \angle BCE$ ...(iv) [Angle opposite to equal sides]

        $\angle BEC + \angle BED = 180°$ [Linear pair]
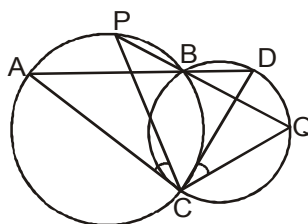
⇒ $\angle BCE + \angle BAD = 180°$ [From (iv) and (i)]

⇒   Trapezium ABCD is cyclic.

[∵ If a pair of opposite angles of a quadrilateral

is 180°, then the quadrilateral is cyclic]
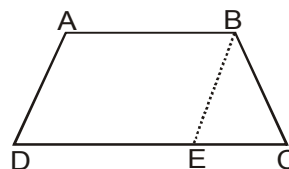
Ex.15 Two circles intersect at two points B and C. Through B, two line segment ABD and PBQ are drawn to intersect the circles at A, D and P, Q respectively. Prove that $\angle ACP = \angle QCD$. **[NCERT]**

Sol. **Given :** Two circles intersect at two points B and C. Through B, two line segments ABD and PBQ are drawn to intersect the circles at A, D and P, Q respectively.

To Prove : $\angle ACP = \angle QCD$

Proof : $\angle ACP = \angle ABP$ ...(i) [Angles in the same segment of a circle are equal]

 $\angle QCD = \angle QBD$ ...(ii) [Angles in the same segment of a circle are equal]

     $\angle ABP = \angle QBD$ ...(iii) [Vertically Opposite Angles]

From (i), (ii) and (iii), $\angle ACP = \angle QCD$.

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Ex.16 Two circles intersect each other at P and Q as shown in the figure. Two straight lines APD and BQC are drawn to intersect the two circles at A, D and B,C. Find x and y.
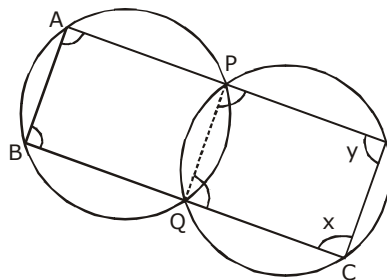
Sol. Let us join PQ. Then,

$\qquad$ ∠PQC = ∠BAP (by exterior angle property of cyclic quadrilateral)

∴ $\qquad$ ∠PQC = 100º

Also, ∠PQC + ∠PDC = 180º (opp. angles of a cyclic quadrilateral)

⇒ $\qquad$ 100º + y = 180º

⇒ $\qquad$ y = 80º

similarly, ∠QPD = ∠ABQ (By exterior angle property of cyclic quadrilateral)

∴ $\qquad$ ∠QPD = 92º

Also, $\quad$ ∠QPD + ∠QCD = 180º (opp. angles of a cyclic quadrilateral)

⇒ $\qquad$ 92º + x = 180º

⇒ x = 180º–92º = 88º Hence x = 88º, y = 80º.

Ex.17 Two circles intersect each other at B and E. ABC and DEF are two straight lines as shown in the figure. Prove that AD||CF.
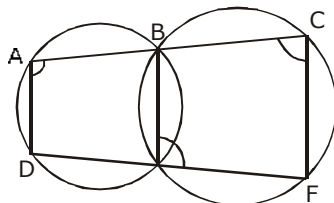
Sol. ∵ ∠BEF is an exterior angle of cyclic quadrilateral ABED, therefore

$\qquad$ ∠BAD = ∠BEF $\qquad\qquad$ ...(1) (exterior angle property of cyclic quadrilateral)

∵ $\qquad$ BCFE is a cyclic quadrilateral, therefore

$\qquad$ ∠BEF + ∠BCF = 180º $\qquad$ ...(2) (opposite angles of cyclic quadrilateral)

From equations (1) and (2) we get

$\qquad$ ∠BAD + ∠BCF = 180º

But these are forming a pair of consecutive interior angles with lines AD and CF and AC is transversal, therefore,

AD||CF (∵ if a pair of consecutive interior angles is supplementary lines are parallel).

Ex.18 In the given figure ∆ABC is an equilateral ∆. Find ∠D and ∠E.

Sol. ∵ ∆ABC is an equilateral triangle.

∴ $\qquad$ ∠BAC = 60º

(∵ each angle of an equilateral triangle is 60º)

But, $\quad$ ∠BDC = ∠BAC

(angles in the same segment)

∴ $\qquad$ ∠BDC = 60º $\qquad$ i.e. ∠D

Also, $\quad$ ∠BDC + ∠BEC = 180º

(opposite angles of a cyclic quadrilateral)

$\quad$ ⇒⇒ $\qquad$ 60º + ∠BEC = 180º

$\qquad$ ⇒ $\qquad\qquad$ ∠BEC = 180º –60º ∠BEC = 120º $\qquad$ i.e. ∠E.
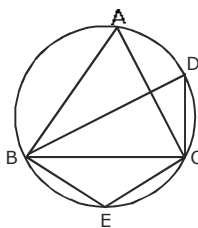
Q.1 Define the following :

(i) Circle,

(ii) Concentric circles,

(iii) Congruent circles

(iv) Chord of a circle,
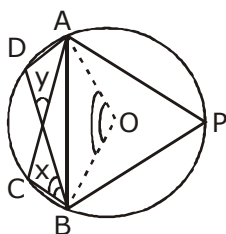
(v) Cyclic quadrilateral

Q.2 How can we locate the centre of a right angled triangle ?

Q.3 What is the relation between circumcenter and centroid of an equilateral triangle ?

Q.4 In Figure O is the centre of the circle of radius 5 cm. OP $\perp$ AB, OQ $\perp$ CD, AB || CD, AB = 6 cm and CD = 8 cm. Determine PQ.
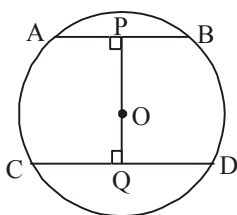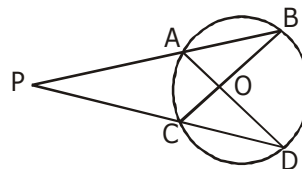

Q.5 In the given figure, if x = 28º and y = 32º, find $\angle ABO$, $\angle AOB$

Q.6 ABCD is a cylic quadrilateral such that AC bisects $\angle A$ as well as $\angle C$. Prove that AC is diameter of the circle circumscribing ABCD.

Q.7 In the given figure, lines PAB and PCD are of equal length, prove that $\Delta PAD \cong \Delta PCB$

Q.8 AB and CD are two parallel chords of a circle lying on the opposite side of centre, such that AB = 18 cm, CD = 24 c. If distance between AB and CD is 21 cm find the radius of the circle.

Q.9 PQ and RS are two parallel chords of a circle lying on the same side of the centre. If PQ = 10 cm and RS = 24 cm and distance between PQ and RS is 7 cm, find the radius of the circle.

Q.10 Two parallel chords AB and CD of a circle with radius 29 lie on opposite side of the center. If AB = 40 cm and CD = 42 cm, find the distance between AB and CD if these lie on opposite side and on the same side of the centre.

Q.11 Prove that any two angles in the same segment of a circle are equal.

Q.12 Prove that angle in a semicircle is right angle.

Q.13 Prove that the sum of either pair of opposite angles of a cyclic quadrilateral is 180º.

Q.14 In the given figure, O is the centre of the circle, lines PBA and PDOC are drawn such that BO = BP. If $\angle P - 24º$ and $\angle ADO = x$, find the value of x.

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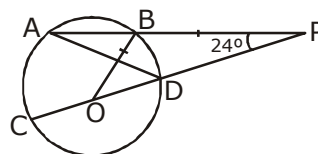
Q.15 In the given figure, AB is the diameter and O is the centre of the circle. AC = CD. Prove that OC || BD.
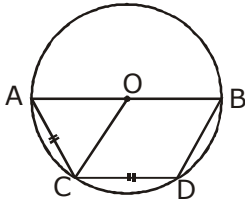
Q.16 AB and CD are two parallel chords of a circle which lie on opposite side of centre O. If BC is a diameter of the circle, prove that AB = CD.

Q.17 Prove that a trapezium is cyclic if and only if it is isosceles.

**Q.18** A, B, C and D are four points on a circle, taken in order, such that AB = CD. Prove that AC = BD.

Q.19 ABCD is a cyclic quadrilateral. If $\angle BCD = 100^\circ$ and $\angle ABD = 70^\circ$, find $\angle ADB$.

Q.20 ABCD is a cyclic quadrilateral in which $\angle DBC = 80^\circ$ and $\angle BAC = 40^\circ$. Find $\angle BCD$.

Q.21 The radius of a circle is 13 cm and the length of one of its chords is 10 cm. Find the distance of the chord from the centre.

Q.22 Find the length of a chord which is at a distance of 5 cm from the centre of a circle of radius 13 cm.

Q.23 In figure two equal chords AB and CD of a circle with centre O, intersect each other at E. Prove that AD = CB.
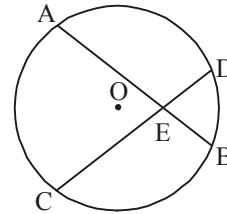
Q.24 In Figure O is the centre of the circle of radius 5 cm. OP ⊥ AB, OQ ⊥ CD, AB || CD, AB = 6 cm and CD = 8 cm. Determine PQ.
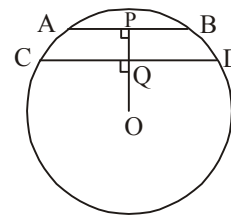
ANSWER KEY

4.	7 cm	**5.**	120º, 60º
8.	15 cm	**9.**	13 cm
10.	41 cm, 1 cm	**14.**	x = 36º
19.	30º	**20.**	60º
21.	12 cm	**22.**	24cm
24.	1 cm		

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Q.1 A chord of length 16 cm is drawn in a circle of radius 10 cm. Calculate the distance of the chord from the centre of the circle.

Q.2 A circle of radius 2.5 cm has a chord of length 4.8 cm. Find the distance of the chord from the centre of the circle.

Q.3 The radius of a circle is 40 cm and the length of perpendicular drawn from its centre to chord is 24 cm. Find the length of the chord.

Q.4 A chord of length 48 cm is drawn at a distance of 7 cm from the centre of a circle. Calculate the radius of the circle.

Q.5 A chord of length 16 cm is at a distance of 15 cm from the centre of the circle. Find the length of the chord of the same circle which is at a distance of 8 cm from the centre.

Q.6 Two parallel chords of lengths 30 cm and 16 cm are drawn on the opposite sides of the centre of a circle of radius 17 cm. Find the distance between the chords.

Q.7 Two parallel chords of lengths 80 cm and 18 cm are drawn on the same side of the centre of a circle of radius 41 cm. Find the distance between the chords.

Q.8 Two parallel chords AB and CD are 3.9 cm apart and lie on the opposite sides of the centre of a circle. If AB = 1.4 cm and CD = 4 cm, find the radius of the circle.

Q.9 AB and CD are two parallel chords of lengths 8 cm and 6 cm respectively. If they are 1 cm apart and lie on the same side of the centre of the circle, find the radius of the circle.

Q.10 PQR is an isosceles triangle inscribed in a circle. If PQ = PR = 25 cm and QR = 14 cm, calculate the radius of the circle to the nearest cm.

Q.11 An isosceles $\triangle$ABC is inscribed in a circle. If AB = AC = $12\sqrt{5}$ cm and BC = 24 cm, find the radius of the circle.

Q.12 An equilatetal triangle of side 9 cm is inscribed in a circle. Find the radius of the circle.

Q.13 If a line ℓ intersects two concentric circles at the points A, B, C and D, as shown in the figure, prove that AB = CD.


Q.14 The radii of two concentric circles are 17 cm and 10 cm. A line segment PQRS cuts the larger circle at P and S and the smaller circle at Q and R. If QR = 12 cm, find the length PQ.

Q.15 In the given figure, O is the centre of the circle; $\angle$OAB = 30° and $\angle$OCB = 40°. Calculate $\angle$AOC.
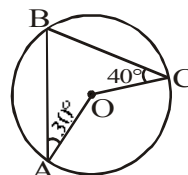
Q.16 In the given figure, O is the centre of the circle and $\angle$AOC = 130°. Find $\angle$ABC.
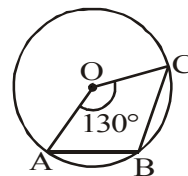
Q.17 In the given figure, O is the centre of the circle and $\angle$AOB = 110°. Calculate (i) $\angle$ACO (ii) $\angle$CAO.
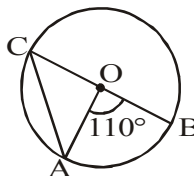
Q.18 In the given figure, AB ∥ DC and $\angle$BAD = 100°. Calculate : (i) $\angle$BCD (ii) $\angle$ADC (iii) $\angle$ABC.
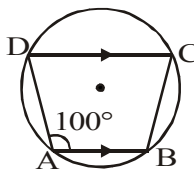
Q.19 In the given figure, $\angle$ACB = 52° and $\angle$BDC = 43°. Calculate (i) $\angle$ADB (ii) $\angle$BAC (iii) $\angle$ABC.
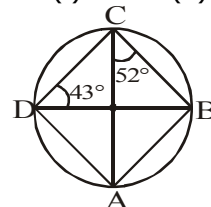
Q.20 In the given figure, O is the centre of the circle. If $\angle$AOB = 140° and $\angle$OAC = 50°, find

(i) $\angle$ABC   (iii) $\angle$OAB

(ii) $\angle$BCO   (iv) $\angle$BCA.

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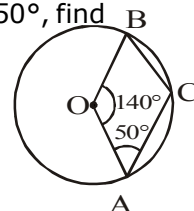
Q.21 In the given figure, ∠BAD = 70°, ∠ABD = 56° and ∠ADC = 72°. Calculate (i) ∠BDC (ii) ∠BCD (iii) ∠BCA
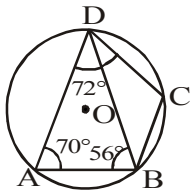
Q.22 In the given figure, O is the centre of the circle. If ∠ADC = 140°, find ∠BAC.
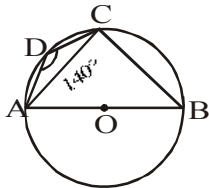
Q.23 In the given figure, O is the centre of the circle and ΔABC is equilateral. Find (i) ∠BDC (ii) ∠BEC.
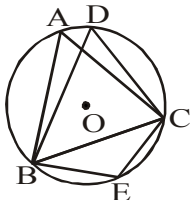
Q.24 In the given figure, O is the centre of the circle and ∠AOC = 160°. Prove that 3∠y – 2∠x = 140°.
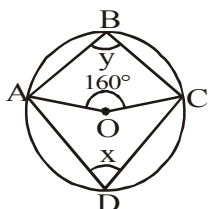
Q.25 In the given figure, AB is a side of a regular 6-sided polygon and AC is a side of a regular 8-sided polygon inscribed in a circle with centre O. Find : (i) ∠AOB (ii) ∠ACB (iii) ∠ABC.
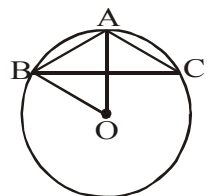
Q.26 (i) In the given figure, AOB is a diameter of the circle with centre O and ∠AOC = 100°, find ∠BDC.
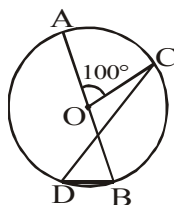
(ii) In the given figure, O is the centre of the circle; ∠AOD = 40° and ∠BDC = 100°. Find ∠OCB.
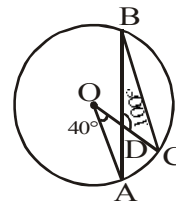
Q.27 In the figure, AB is parallel to DC, ∠BCE = 80° and ∠BAC = 25°. Find : (i) ∠CAD (ii) ∠CBD (iii) ∠ADC
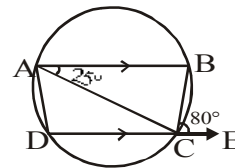
Q.28 In the given figure, O is the centre of the circle and ∠OBC = 50°. Calculate (i) ∠ADC (ii) ∠AOC.
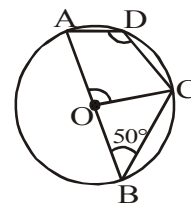
**Q.29** In the given figure, arc AC and arc BD are two equal arcs of a circle. Prove that chord AB and chord CD are parallel.
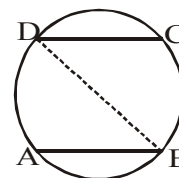
Q.30 Prove that the angle subtended at the centre of a circle, is bisected by the radius through the mid-point of the arc.

Q.31 In the given figure, P is the mid-point of arc APB and M is the midpoint of chord AB of a circle with centre O. Prove that :
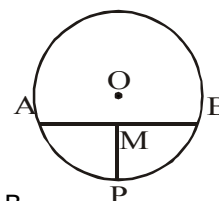
(i) PM ⊥ AB

(ii) PM produced will pass through the centre O;
(iii) PM produced will bisect the major arc AB.

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Q.32 Prove that in a cyclic trapezium, the non-parallel sides are equal.

Q.33 P is a point on a circle with centre O. If P is equidistant from the two radii OA and OB, prove that arc AP = arc BP.

Q.34 In the given figure, two chords AC and BD of a circle intersect at E. If arc AB = arc CD, prove that: BE = EC and AE = ED.
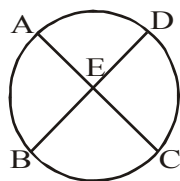
Q.35 In the given figure, two chords AB and CD of a circle intersect at a point P. If AB = CD, prove that : arc AD = arc CB.
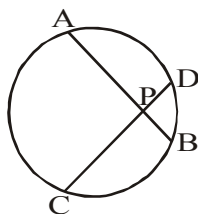
Q.36 If two sides of a cyclic quadrilateral are parallel, prove that :

(i) its other two sides are equal,

(ii) its diagonals are equal.

Q.37 In the given figure, AB, BC and CD are equal chords of a circle with centre O and AD is a diameter. If $\angle DEF = 110°$, find (i) $\angle AEF$ (ii) $\angle FAB$.
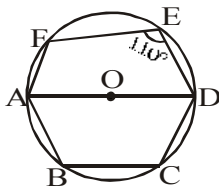
Q.38 In the given figure, ABCDE is a pentagon inscribed in a circle. If AB = BC = CD, $\angle BCD = 110°$ and $\angle BAE = 120°$, find : (i) $\angle ABC$ (ii) $\angle CDE$ (iii) $\angle AED$ (iv) $\angle EAD$
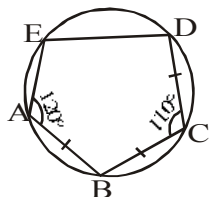
Q.39 In the given figure, $\triangle ABC$ is an isosceles triangle inscribed in a circle with centre O. If AB = AC, prove that : AP bisects $\angle BPC$.
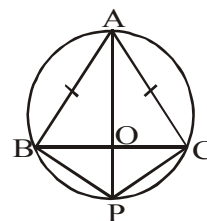
ANSWER KEY

1.	6 cm	**2.**	0.7 cm
3.	64 cm	**4.**	25 cm
5.	30 cm	**6.**	23 cm
7.	31 cm	**8.**	2.5 cm
9.	5 cm	**10.**	13 cm
11.	15 cm	**12.**	$3\sqrt{3}$ cm
14.	9 cm	**15.**	$\angle AOC = 140°$

16. $\angle ABC = 115°$ **17.** (i) 55° (ii) 55°

18. (i) $\angle BCD = 80°$ (ii) $\angle ADC = 80°$ (iii) $\angle ABC = 100°$

19. (i) $\angle ADB = 52°$ (ii) $\angle BAC = 43°$ (iii) $\angle ABC = 85°$

20. (i) $\angle ABC = 40°$ (ii) $\angle BCO = 60°$ (iii) $\angle OAB = 20°$

(iv) $\angle BCA = 110°$

**21.** (i) $\angle BDC = 18°$ (ii) $\angle BCD = 110°$ (iii) $\angle BCA = 54°$

22. $\angle BAC = 50°$

23. (i) $\angle BDC = 60°$ (ii) $\angle BEC = 120°$

25. (i) $\angle AOB = 60°$ (ii) $\angle ACB = 30°$

(iii) $\angle ABC = 22°30'$

26. (i) $\angle BDC = 40°$ (ii) $\angle OCB = 60°$

27. (i) $\angle CAD = 55°$ (ii) $\angle CBD = 55°$ (iii) $\angle ADC = 100°$

28. (i) $\angle ADC = 130°$ (ii) $\angle AOC = 100°$

37. (i) $\angle AEF = 20°$ (ii) $\angle FAB = 130°$

38. (i) $\angle ABC = 110°$ (ii) $\angle CDE = 95°$

(iii) $\angle AED = 105°$ (iv) $\angle EAD = 50°$

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Q.1 The radius of a circle is 13 cm and the length of one of its chords is 10 cm. The distance of the chord from the centre is.
(A) 11.5 cm
(B) 12 cm
(C) $\sqrt{69}$ cm
(D) 23 cm

Q.2 A chord is at a distance of 8 cm from the centre of a circle of radius 17 cm. The length of the chord is
(A) 25 cm
(B) 12.5 cm
(C) 30 cm
(D) 9 cm

Q.3 In the given figure, BOC is a diameter of a circle and AB = AC. Then, $\angle$ABC = ?
(A) 30º
(B) 45º
(C) 60º
(D) 90º
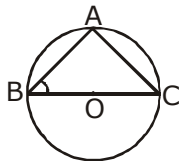
Q.4 In the given figure, O is the centre of circle and $\angle$ACB = 30º. Then $\angle$AOB = ?
(A) 30º
(B) 15º
(C) 60º
(D) 90º
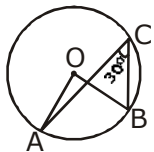
Q.5 In the given figure, O is the centre of a circle. If $\angle$OAB = 40º and C is a point on the circle, then $\angle$ACB = ?
(A) 40º
(B) 50º
(C) 80º
(D) 100º
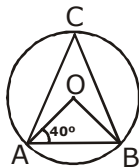
Q.6 In the given figure, AOB is a diameter of a circle with centre O such that AB = 34 cm and CD is a chord of length 30 cm. Then, the distance of CD from AB is
(A) 8 cm
(B) 15 cm
(C) 18 cm
(D) 6 cm
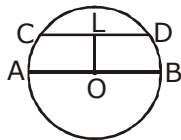
Q.7 AB and CD are two equal chords of a circle with centre O such that $\angle$AOB =80º then, $\angle$COD = ?
(A) 100º
(B) 80º
(C) 120º
(D) 40º
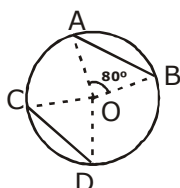
Q.8 In the given figure, CD is the diameter of a circle with centre O and CD is perpendicular to chord AB. If AB = 12 cm and CE = 3 cm, then radius of the circle is
(A) 6 cm
(B) 9 cm
(C) 7.5 cm
(D) 8 cm
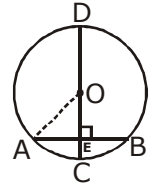
Q.9 In the given figure, O is the centre of a circle and diameter AB bisects the chord CD at a point E such that CE = ED = 8 cm and ED = 4 cm. Then radius of the circle is
(A) 10 cm
(B) 12 cm
(C) 6 cm
(D) 8 cm
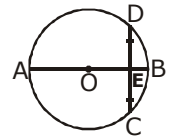
Q.10 In the given figure, BOC is a diameter of a circle with centre O. If AB and CD are two chord such that AB||CD. If AB = 10 cm, then CD = ?
(A) 5 cm
(B) 12.5 cm
(C) 15 cm
(D) 10 cm
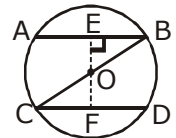
Q.11 In the given figure, AB is a chord of a circle with centre O and AB is produced to C such that BC = OB. Also, CO is joined and produced to meet the circle in D. If $\angle$ACD = 25º, then $\angle$AOD = ?
(A) 50º
(B) 75º
(C) 90º
(D) 100º
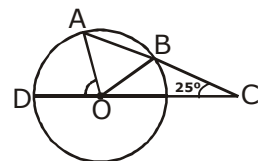
Q.12 In the given figure, AB is a chord of a circle with centre O and BOC is a diameter. If OD$\perp$AB such that OD = 6 cm, then AC = ?
(A) 9 cm
(B) 12 cm
(C) 15 cm
(D) 7.5 cm
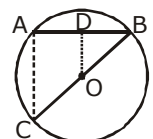
Q.13 An equilateral triangle of side 9 cm is inscribed in a circle. The radius of the circle is
(A) 3 cm (B) $3\sqrt{3}$ cm (C) $3\sqrt{2}$ cm (D) 6 cm

Q.14 The angle in a semicircle measures
(A) 45º   (B) 60º
(C) 90º   (D) 36º

Q.15 Angles in the same segment of a circle area are
(A) equal   (B) complementary
(C) supplementary   (D) none of these

Q.16 In the given figure, $\triangle ABC$ and $\triangle DBC$ are inscribed in a circle such that $\angle BAC = 60º$ and $\angle DBC = 50º$. Then $\angle BCD$ = ?
(A) 50º
(B) 60º
(C) 70º
(D) 80º
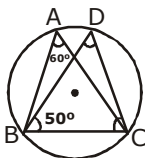
Q.17 In the given figure, BOC is a diameter of a circle with centre O. If $\angle BCA = 30º$, then $\angle CDA$ = ?
(A) 30º
(B) 45º
(C) 60º
(D) 50º
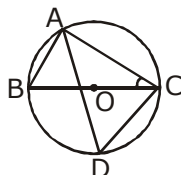
Q.18 In the given figure, O is the centre of a circle. If $\angle OAC = 50º$, then $\angle ODB$ = ?
(A) 40º
(B) 50º
(C) 60º
(D) 75º
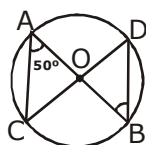
Q.19 In the given figure, O is the centre of a circle in which $\angle OBA = 20º$ and $\angle OCA = 30º$. Then, $\angle BOC$ = ?
(A) 50º
(B) 90º
(C) 100º
(D) 130º

Q.20 In the given figure, O is the centre of a circle. If $\angle AOB = 100º$ and $\angle AOC = 90º$, then $\angle BAC$ = ?
(A) 85º   (C) 95º
(B) 80º   (D) 75º
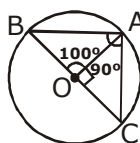
Q.21 In the given figure, O is the centre of a circle. Then, $\angle OAB$ = ?
(A) 50º
(B) 60º
(C) 55º
(D) 65º
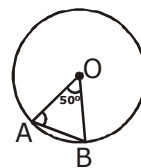
Q.22 In the given figure, O is the centre of a circle and $\angle AOC = 120º$. Then, $\angle BDC$ = ?
(A) 60º
(B) 45º
(C) 30º
(D) 15º
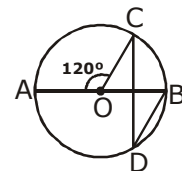
Q.23 In the given figure, O is the centre of a circle and $\angle OAB = 50º$. Then $\angle CDA$ = ?
(A) 40º
(B) 50º
(C) 75º
(D) 25º
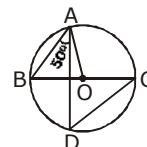
Q.24 In the given figure, AB and CD are two intersecting chords of a circle. If $\angle CAB = 40º$ and $\angle BCD = 80º$, then $\angle CBD$ = ?
(A) 80º
(B) 60º
(C) 50º
(D) 70º
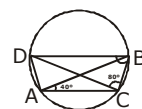
Q.25 In the given figure, O is the centre of a circle and chords AC and BD intersect at E. If $\angle AEB = 110º$ and $\angle CBE = 30º$, then $\angle ADB$ =
(A) 70º
(B) 60º
(C) 80º
(D) 90º
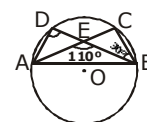
Q.26 In the given figure, O is the centre of a circle in which $\angle AOC = 20º$ and $\angle OCB = 50º$. Then, $\angle AOC$ =?
(A) 50º
(B) 70º
(C) 20º
(D) 60º
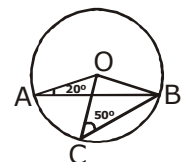
Q.27 In the given figure, AOB is a diameter and ABCD is a cyclic quadrilateral. If $\angle ADC = 120º$, then $\angle BAC$ = ?
(A) 60º (B) 30º
(C) 20º (D) 45º
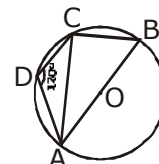
Q.28 In the given figure ABCD is a cyclic quadrilateral in which AB||DC and $\angle BAD = 100º$.

Then $\angle ABC = ?$
(A) 80º
(B) 100º
(C) 50º
(D) 40º
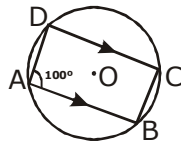
Q.29 In the given figure, O is the centre of a circle and $\angle AOC = 130º$. Then $\angle ABC = ?$
(A) 50º
(B) 65º
(C) 115º
(D) 130º
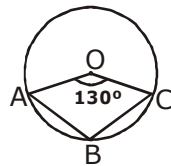
Q.30 In the given figure, AOB is a diameter of a circle and CD || AB. If $\angle BAD = 30º$, then $\angle CAD = ?$
(A) 30º
(B) 60º
(C) 45º
(D) 50º
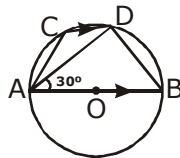
Q.31 In the given figure, O is the centre of a circle in 0which $\angle AOC = 100º$. Side AB of quad. OABC has been produced to D. Then $\angle CBD = ?$
(A) 50º
(B) 40º
(C) 25º
(D) 80º
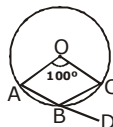
Q.32 In the given figure, O is the centre of a circle and $\angle OAB = 50º$. Then $\angle BOD = ?$
(A) 130º
(B) 50º
(C) 100º
(D) 80º
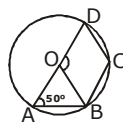
Q.33 In the given figure, ABCD is a cyclic quadrilateral in which BC = CD and $\angle CBD = 35º$.

Then, $\angle BAD =$
(A) 65º
(B) 70º
(C) 110º
(D) 90º
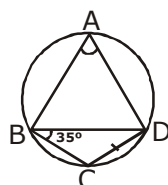
Q.34 In the given figure, equilateral $\triangle ABC$ is inscribed in a circle and ABCD is a quadrilateral, as shown. Then $\angle BDC = ?$
(A) 90º
(B) 60º
(C) 120º
(D) 150º
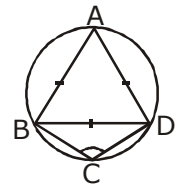
Q.35 In the given figure, sides AB and AD of quad. ABCD are produced to E and F respectively.

If $\angle CBE = 100º$, then $\angle CDF = ?$
(A) 100º
(B) 80º
(C) 130º
(D) 90º
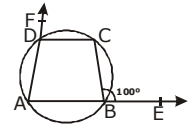
Q.36 In the given figure, O is the centre of a circle and $\angle AOB = 14º$. Then $\angle ACB = ?$
(A) 70º
(B) 80º
(C) 110º
(D) 40º
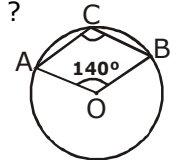
Q.37 In the given figure, O is the centre of a circle and $\angle AOB = 13º$. Then $\angle ACB = ?$
(A) 50º
(B) 65º
(C) 115º
(D) 155º
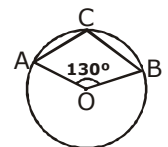
Q.38 In the given figure, ABCD and ABEF are two cyclic quadrilaterals. If $\angle BCD = 110º$, then $\angle BEF = ?$
(A) 55º
(B) 70º
(C) 90º
(D) 110º
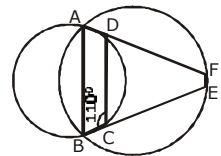
Q.39 In the given figure, ABCD is a cyclic quadrilateral in which DC is produced to E and CF is drawn parallel to AB such that $\angle ADC = 95º$ and $\angle ECF = 20º$. Then, $\angle BAD = ?$
(A) 95º
(B) 85º
(C) 105º
(D) 75º
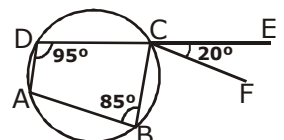
Q.40 Two chords AB and CD of a circle intersect each other at a point E outside the circle. If AB = 11 cm, BE = 3 cm and DE = 3.5 cm, then CD = ?
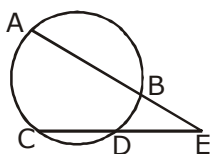
(A) 10.5 cm   (B) 9.5 cm

(C) 8.5 cm   (D) 7.5 cm

Q.41 In the given figure, A and B are the centres of two circles having radii 5 cm and 3 cm respectively and intersecting at points P and Q respectively. If AB = 4 cm, then the length of common chord PQ is
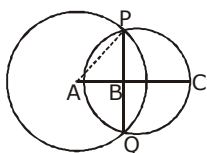
(A) 3 cm   (B) 6 cm

(C) 7.5 cm   (D) 9 cm

Q.42 In the given figure, $\angle AOB = 90º$ and $\angle ABC = 30º$. Then $\angle CAO = ?$

(A) 30º   (B) 45º

(C) 60º   (D) 90º
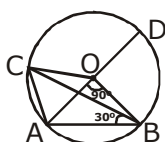
Q.43 If the length of a chord of a circle is 16 cm and is at a distance of 15 cm from the centre of the circle, then the radius of the circle (in cm) is :

(A) 15   (B) 16

(C) 17   (D) 34

Q.44 The radius of a circle is 6 cm. The perpendicular distance from the centre of the circle to the chord which is 8 cm in length, is–

(A) $\sqrt{5}$ cm   (B) $2\sqrt{5}$ cm

(C) $2\sqrt{7}$ cm   (D) $\sqrt{7}$ cm

Q.45 An equilateral triangle ABC is inscribed in a circle with centre O. Then, $\angle BOC$ is equal to

(A) 30º   (B) 60º

(C) 90º   (D) 120º
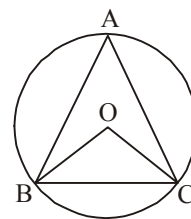
Q.46 In the adjoining figure, O is the centre of the circle. If $\angle OBC = 25º$, then $\angle BAC$ is equal to–

(A) 25º   (B) 30º

(C) 65º   (D) 150º
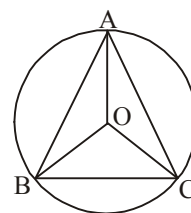
Q.47 In fig. O is the centre of the circle. If $\angle BAC = 52º$, then $\angle OCD$ is equal to–

(A) 52º   (B) 104º

(C) 128º   (D) 76º
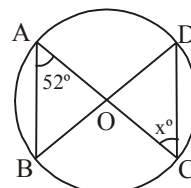
Q.48 In a circle with centre O, AB and CD are two diameters perpendicular to each other. The length of chord AC is –

(A) 2AB   (B) $\sqrt{2}$ AB

(C) $\dfrac{1}{2}$ AB   (D) $\dfrac{1}{\sqrt{2}}$ AB

Q.49 In the adjoining figure. POQ is the diameter of the circle. R and S are any two points on the circle. Then,
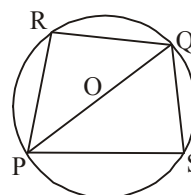
(A) $\angle PRQ > \angle PSQ$ (B) $\angle PRQ < \angle PSQ$

(C) $\angle PRQ = \angle PSQ$ (D) $\angle PRQ = \dfrac{1}{2} \angle PSQ$

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Q.50 In the adjoining figure, A, B, C are three points on a circle with centre O. If ∠AOB = 90º and ∠BOC = 120º, then ∠ABC is–
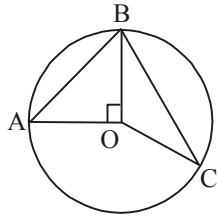
(A) 60º (B) 75º
(C) 90º (D) None of these

Q.51 In the adjoining figure, ∠ADC = 140º and AOB is the diameter of the circle. Then, ∠BAC is equal to –

(A) 40º (B) 50º
(C) 70º (D) 75º
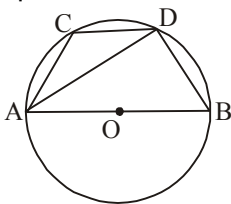
Q.52 If one angle of a cyclic trapezium is triple the other, then the greater one measures :
(A) 90º (B) 105º
(C) 120º (D) 135º

Q.53 In the adjoining figure, if ∠QPR = 67º and ∠SPR = 72º and RP is a diameter of the circle, then ∠QRS is equal to–

(A) 41º (B) 23º
(C) 67º (D) 18º
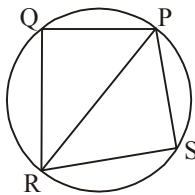
Q.54 In the adjoining figure, O is the centre of a circle. Chords AB and CD intersect at P. If AB = 16 cm, CP = 6 cm, PD = 8 cm and AP > PB. Then, AP is–
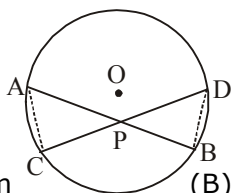
(A) 12 cm (B) 24 cm
(C) 8 cm (D) 6 cm

Q.55 In the adjoining figure, O is the centre of the circle and PQ, RS are its equal chords, OD ⊥ PQ and OE ⊥ RS. If ∠DOE = 130º, then ∠PDE is–

(A) 50º (B) 65º
(C) 40º (D) 70º
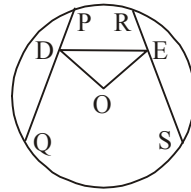
Q.56 If a square ABCD is inscribed in a circle and AB = 4 cm then the radius of the circle is
(A) 2 cm (B) $2\sqrt{2}$ cm
(C) 4 cm (D) $4\sqrt{2}$ cm

ANSWER KEY

1.	B	**2.**	C	**3.**	B	**4.**	C
5.	B	**6.**	A	**7.**	B	**8.**	C
9.	A	**10.**	D	**11.**	B	**12.**	B
13.	C	**14.**	C	**15.**	A	**16.**	C
17.	C	**18.**	B	**19.**	C	**20.**	A
21.	D	**22.**	C	**23.**	B	**24.**	B
25.	C	**26.**	D	**27.**	B	**28.**	B
29.	C	**30.**	A	**31.**	A	**32.**	C
33.	B	**34.**	C	**35.**	B	**36.**	C
37.	C	**38.**	D	**39.**	C	**40.**	C
41.	B	**42.**	C	**43**	C	**44**	B
45	D	**46**	C	**47**	A	**48**	D
49	C	**50**	B	**51**	B	**52**	D
53	A	**54**	A	**55**	B	**56**	B

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CHOOSE THE CORRECT ONE

1. AB is a chord of a circle with centre O and radius 17 cm. If OM ⊥ AB and OM = 8 cm, find the length of chord AB.

    (A) 12 cm   (B) 30 cm   (C) 15 cm   (D) 24 cm

2. AB is a chord of length 24 cm of a circle with centre O and radius 13 cm. Find the distance of the chord from the centre.

    (A) 5 cm   (B) 6 cm   (C) $\sqrt{407}$ (D) None of these

3. 48 cm long chord of a circle is at a distance of 7 cm from the centre. Find the radius of the circle.

    (A) 5 cm   (B) 17 cm   (C) 25 cm   (D) None of these

4. A chord of a circle is 12 cm in length and its distance from the centre is 8 cm. Find the length of the chord of the same circle which is at a distance of 6 cm from the centre.

    (A) 30 cm   (B) 24 cm   (C) 16 cm   (D) 18 cm

5. Which of the following statement(s) is / are true ?

    (A) Two chords of a circle equidistant from the centre are equal

    (B) Equal chords in a circle subtend equal angles at the centre

    (C) Angle in a semicircle is a right angle

    (D) All the above

6. In the given figure, find the value of x.

    (A) 68°   (B) 63°

    (C) 252°   (D) None of these

7. In the given figure, $\triangle$ABC is inscribed in a circle with centre O. If $\angle$ACB = 65°, find $\angle$ABC.

    (A) 25°   (B) 35°

    (C) Cannot be determined   (D) None of these

8. In the given figure if O is the centre of the circle, then find x.

    (A) 55°   (B) 208°

    (C) 52°   (D) None of these

9. An equilateral triangle PQR is inscribed in a circle with centre O. Find $\angle$QOR.

    (A) 60°   (B) 120°   (C) 30°   (D) None of these

10. In the given figure, $\triangle$XYZ is inscribed in a circle with centre O.

    If the length of chord YZ is equal to the radius of the circle OY then $\angle$YXZ =

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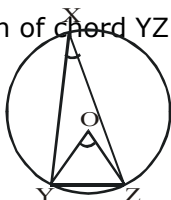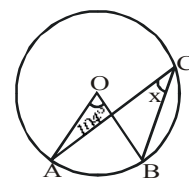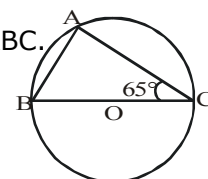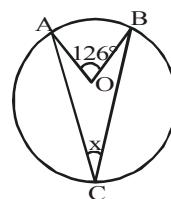
(A) 60°   (B) 30°

(C) 80°   (D) 100°

11. In the given figure, O is the centre of a circle. If ∠DAC = 54° and ∠ACB = 63° then ∠BAC =

(A) 72°   (B) 54°

(C) 27°   (D) 90°
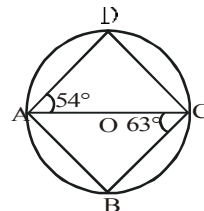
12. In the given figure, AOB is a diameter of a circle with centre O. If ∠BOD = 120°, find ∠ACD.

(A) 30°   (B) 40°

(C) 60°   (D) 90°
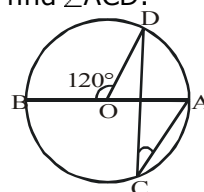
13. In the given figure, O is the centre of the circle. Find the value of x.

(A) 30°   (B) 45°

(C) 60°   (D) 75°
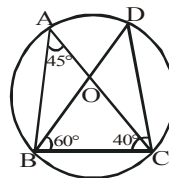
14. In the given figure, ABCD is a quadrilateral incribed in a circle.

Diagonals AC and BD are joined. If ∠CAD = 50° and ∠BDC = 45°. Find ∠BCD.

(A) 75°   (B) 105°

(C) 85°   (D) 60°
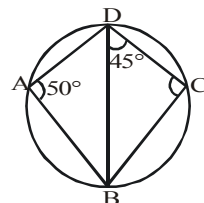
15. Find the value of x in the given figure.

(A) 45°   (B) 35°

(C) 60°   (D) 55°
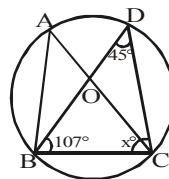
16. In the given figure, two chords AB and CD of a circle intersect each other at a point E such that ∠BAC = 45°, ∠BED = 120°. Then find ∠ABD.

(A) 15°   (B) 30°

(C) 45°   (D) 60°
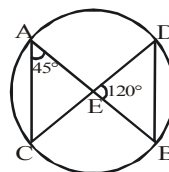
17. In the given figure, AOB and COD are two diameters of a circle with centre O. If ∠OAC = 60°. Find ∠ABD.
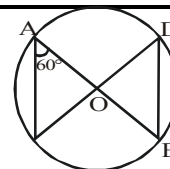
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(A) 40°   (B) 60°

(C) 50°   (D) 80°

18. In the given figure, ABCD is a quadrilateral inscribed in a circle. Diagonals AC and BD are joined.

If $\angle CAD = 40°$ and $\angle BDC = 25°$. Find $\angle BCD$.

(A) 85°   (B) 120°

(C) 115°   (D) 95°
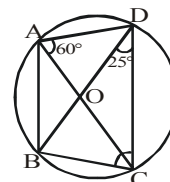
19. Two chords AB and CD of a circle cut each other when produced outside the circle at P. AD and BC are joined. If $\angle PAD = 30°$ and $\angle CPA = 45°$. Find $\angle CBP$

(A) 105°   (B) 115°

(C) 135°   (D) None of these
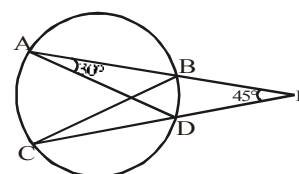
20. In the given figure, $\triangle ABC$ is inscribed in a circle. The bisector of $\angle BAC$ meets BC at D and the circle at E. If EC is joined then $\angle ECD = 30°$. Find $\angle BAC$.

(A) 30°   (B) 40°

(C) 50°   (D) 60°
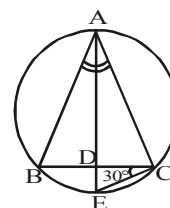
21. In the given figure, ABCD is a cycle quadrilateral in which $\angle BAD = 120°$. Find $\angle BCD$.

(A) 240°   (B) 60°

(C) 120°   (D) 180°
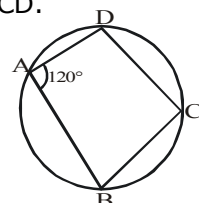
22. In the given figure POQ is a diameter of a circle with centre O and PQRS is a cyclic quadrilateral. SQ is joined. If $\angle R = 138°$, find $\angle PQS$.

(A) 90°   (B) 42°

(C) 48°   (D) 38°
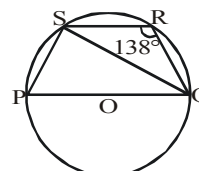
23. In the given figure, PQRS is a cyclic trapezium in which PQ ∥ SR. If $\angle P = 82°$. Find $\angle S$.

(A) 98°   (B) 108°

(C) Data not sufficient   (D) None of these
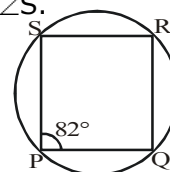
24. Two circles intersect in A and B. Quadrilaterals PCBA and ABDE are inscribed in these circles such that PAE and CBD are line segment. If $\angle P = 95°$ and $\angle C = 40°$. Find the value of Z.

(A) 65°   (B) 105°

(C) 95°   (D) 85°
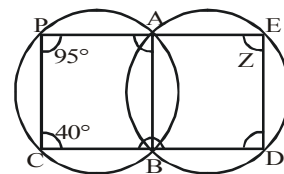
25. Which of the following statement(s) is / are true ?

(A)   Sum of the opposite angles of a cycqlic quadrilateral is 180°

(B)   If one side of a cyclic quadrilateral is produced, the exterior angle so formed is equal to the interior   opposite angle

(C)   A cyclic parallelogram is a rectangle

(D)   All the above

26. The circumference of a circle is 60 cm. The length of an arc of 90° is

(A) 10 cm   (B) 15 cm   (C) 20 cm   (D) None of these

27. A circle is divided into 12 equal parts. The number of degrees in each arc is

(A) 30°   (B) 60°   (C) 45°   (D) None of these

28. An equilateral triangle XYZ is inscribed in a circle with centre O. The measure of XOY is

(A) 60°   (B) 120°   (C) 45°   (D) 75°

29. A diameter of a circle is also a

(A) Tangent   (B) Chord   (C) Secant   (D) Radius

30. The number of tangents that can be drawn to a circle at a given point on it is

(A) Two   (B) One   (C) Zero   (D) Three

CIRCLE				ANSWER KEY				OLYMPIAD EXERCISE # 4	
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	A	C	C	D	B	A	C	B	B
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	C	A	D	C	B	A	B	C	A	D
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	B	C	A	D	D	B	A	B	B	B

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GEOMETRICAL CONSTRUCTION

INTRODUCTION

In the chapter "Lines and Angles" and "Triangles" we have proved many theorems and properties by using diagrams in which angles and sides of triangles were drawn in approximate measurement. The diagrams were drawn to have the idea of the situations according to the given conditions. In this chapter, we shall construct some angles and triangles in precise measurement by using only two geometrical instruments. These two instruments' are, a graduated ruler and a compass.

CONSTRUCTION OF PERPENDICULAR BISECTOR OF A LINE SEGMENT

We want to construct the perpendicular bisector of the given line segment AB.
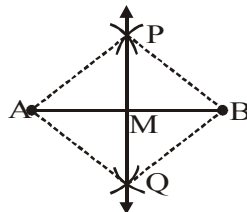
Steps of Construction:

1. Taking A and B as centres and radius $> \frac{1}{2}$ AB, draw, arcs on both sides of the line segment AB.

2. The arcs are drawn in such a way that on both sides of AB, we get intersection points P and Q.

3. Join PQ. PQ intersects AB at M. Here, PMQ is the required perpendicular bisector of AB.

    Justification. In figure, Join AP, AQ, BP and BQ.

    Here, AP = BP = BQ = AQ   (Each = radius of the arc)

    $\Rightarrow$ APBQ is a rhombus.

    $\Rightarrow$ Diagonals AB and PQ are right bisectors of each other.

    Hence, PQ is perpendicular bisector of the chord AB.

CONSTRUCTION OF BISECTOR OF A GIVEN ANGLE

We want to construct the bisector of given angle ABC.
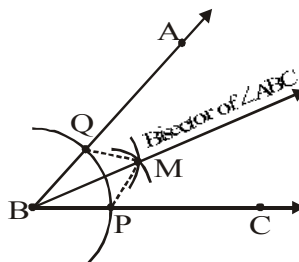
Steps of Construction:

1. Taking B as centre, we draw an arc of a circle which meets BC at P and BA at Q.

2. Now, taking P and Q as centres and radius $> \frac{1}{2}$ PQ draw two arcs so that they intersect at a point M.

3. Join BM.

    Here, the ray BM is the required bisector of $\angle$ABC.

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Justification. In figure, Join PM and QM.

In ∆BPM and ∆BQM, we have

	BP = BQ	(Radius of the first arc)
	PM = QM	(Radius of the second arc)
	BM = BM	(Common)
⇒	∆BPM ≅ ∆BQM	

By CPCT, we have ∠PBM = ∠QBM

Hence BM bisects ∠ABC.

Construction of 60° angle

We will construct 60° angle at the initial point A of the given ray AB.
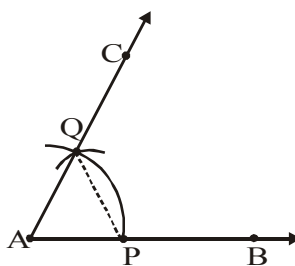
Steps of Construction :

1. Taking A as centre and radius = r (say), we draw an arc of a circle. The arc intersects AB at P.

2. Now, taking P as centre and same radius r, we again draw an arc of a circle which intersects the previous arc at Q.

3. Join AQ and produce this as ray AC.

   Here, ∠CAB = 60°.

   Justification:

   Join PQ.

   We know that AP = AQ = PQ = r.

   ⇒ ∆PAQ is equilateral. ⇒ ∠PAQ = 60°.

Construction of 30° Angle

We will construct 30° and at the initial point A of the given ray AB.

Steps of construction :

1. Taking A as centre and radius = r (say), we draw an arc of a circle. The arc intersects AB at P ..

2. Now, taking P as centre and same radius r, we again draw an arc of a circle which intersects the previous arc at Q.

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3. Join AQ and produce the ray AC. Here ∠BAC = 60°.

4. Now, taking P and Q as centres and some radius r' > r, we draw arcs which intersect at R.

5. Join AR and produce the ray AD along AR.

6. Here, AD is bisector of ∠BAC = 60°.

Therefore, we have ∠BAD = 30°.

Construction of 45° Angle

We will construct 45° angle at the initial point A of the given ray AB.

Steps of construction :

1. First of all, we construct ∠BAC = 60°

2. We find AD biector of ∠BAC.

Here; ∠BAD = ∠DAC = 30°

3. Now, we find AE bisector of ∠CAD.

Here, ∠DAE = ∠CAE = 15°.

4. ∠BAE = ∠BAD + ∠DAE = 30° + 15° = 45°
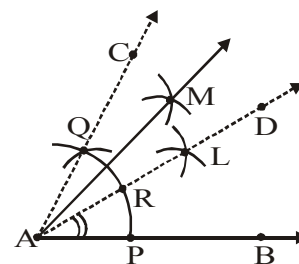
Construction of 90° Angle

Steps of Construction. :

1. We construct ∠CAB = ∠CAD = 60°

2. Now, we find AE bisector of ∠CAD.

3. ∠BAE = ∠BAC + ∠CAE

$= ∠BAC + \dfrac{1}{2} ∠CAD = 60° + \dfrac{1}{2} × 60°$

Hence, ∠BAE = 90°

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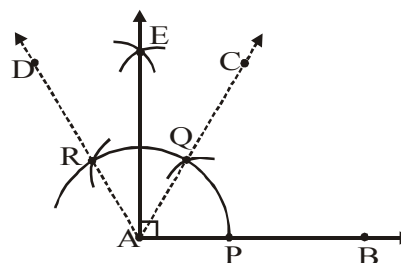
SOLVED PROBLEMS

Ex.1. Construct a triangle ABC in which BC = 7cm, ∠B = 75º and AB + AC = 13cm.   **[NCERT]**

Sol.
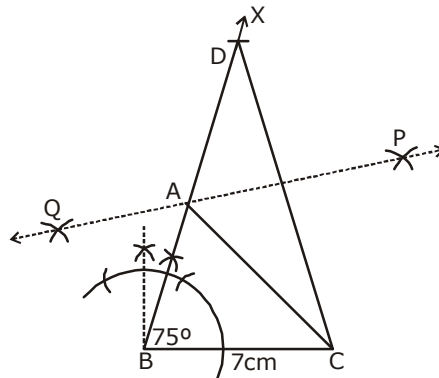
We follow the following steps of construction-
1. Draw a line segment BC = 7 cm
2. At B construct an angle XBC = 75º
3. From BX cut an arc BD of length 13 cm.
4. Join CD.
5. Draw PQ, perpendicular bisector of CD intersecting BD at A.
6. Join AC.
∆ABC is the required triangle.
Justification. In ∆ABC, BC = 7cm ∠B = 75º.
∵ A lies on perpendicular bisector of CD, therefore AC = AD.
∴ AB + AC = AB + AD = BD = 13cm. Fig.

Ex.2 Construct a right angled triangle whose base is 4 cm and sum of its hypotenuse and other side is 8cm.

Sol. Let we have to construct ∆ABC with base
BC = 4cm, ∠B = 90º and AB + AC = 8cm.
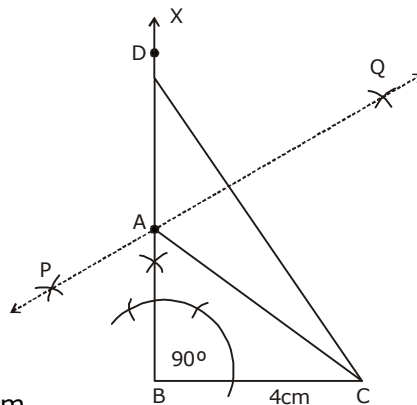
Steps of Construction-
1. Draw a line segment BC = 4cm.
2. At B draw a ray BX such that ∠XBC = 90º
3. From BX cut BD = 8cm.
4. Join DC.
5. Draw PQ perpendicular bisector of CD, which intersects BX at A.
6. Join AC.
∆ABC is the required triangle.
Justification. In ∆ABC, BC = 4cm, ∠B = 90º
∵ A lies on perpendicular bisector of CD.
∴ AD = AC
∴ AB + AC = AB + AD = BD = 8cm.

Ex.3 Construct a triangle ABC with AB = 5cm, BC + CA= 7.5cm and ∠B = 60º.
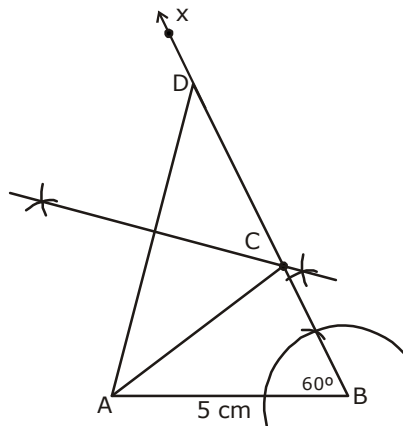
Sol.

To construct △ABC we follow the following steps of construction-
1. Draw a line segment AB= 5cm.
2. At B construct ∠XBA = 60º.
3. Cut BD = 7.5 from BX.
4. Construct perpendicular bisector of AD intersecting BD at C.
5 Join AC.
△ABC is the required triangle.

Justification. C lies on perpendicular bisector of AD, therefore CA = CD.

∴ AC + BC = CD + BC = BD = 7.5 cm.

Ex.4 Construct a triangle with base BC = 4.5 cm, ∠B = 45º and AB− AC = 2.5 cm,
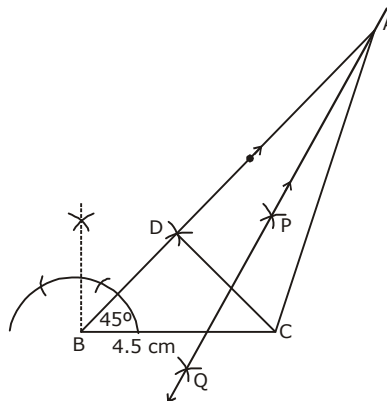
Sol.

Given in △ABC, BC = 4.5cm, ∠B = 45º, AB − AC 2.5 cm. In order to construct △ABC, we follow the following steps of construction-

1. Draw BC = 4.5 cm.

2. At B construct ∠XBC = 45º.

3. From BX cut BD = 2.5 cm.

4. Join CD.

5. Draw PQ perpendicular bisector of CD, intersecting BX at A. 6. Join AC.

△ABC is the required triangle.

Justification. in △ABC, BC = 4.5cm, ∠B = 45º, Also A is equidistant from C and D as it lies on perpendicular bisector of CD, i.e., AC = AD.

∴ AB − AC = AB - AD = BD = 2.5cm.

Ex.5 Construct a triangle PQR in which QR = 6 cm, ∠Q = 60º and PR – PQ = 2cm.
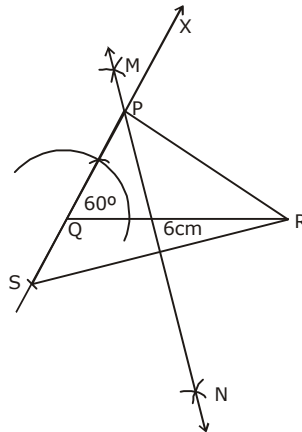
Sol.

Given base QR = 6cm, ∠Q = 60º and PR – PQ = 2cm. Here side of required ΔPQR which stands at Q i.e., PQ, is shorter than other side PR by 2cm.

Therefore to construct ΔPQR which stands at Q i.e., is shorter than other side PR by 2cm.

Therefore to construct ΔPQR, we follow the following steps of construction-

1. Draw base QR = 6cm.

2. At Q construct an angle XQR = 60º.

3. From the ray QX extended in opposite direction cut QS = 2cm.

4. Join RS.

5. DRaw MN the perpendicular bisector of RS, intersecting QX at p.

6. Join PR.

ΔPQR is the required triangle.

Justification. In ΔPQR We have QR = 6 cm, ∠Q = 60º Also as P lies on perpendicular bisector of SR, PS = PR

∴ PR – PQ = PS – PQ = SQ = 2cm.

Ex.6 Construct a triangle XYZ in which ∠Y =30º, ∠Z = 90ºand XY + YZ + ZX = 11cm. **[NCERT]**
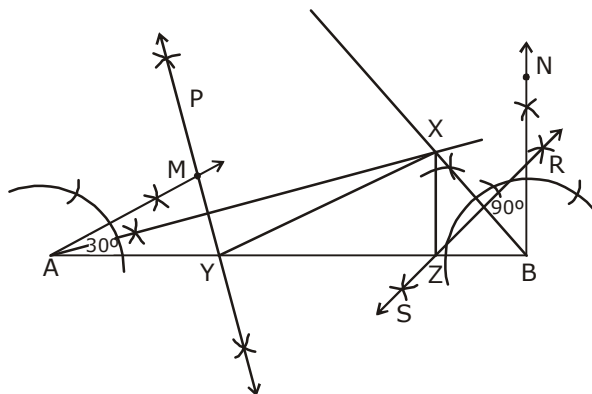
Sol.

We are given perimeter of ΔXYZ as 11cm adn base angle 30º and 90º.

In order to construct triangle XYZ, we follow the following steps of constructions-

1. Draw AB = 11cm.

2. At A construct ∠MAB = 30º and at B construct ∠NBA = 90º.

3. Draw bisectors of ∠MAB and ∠NBA which intersect each other at X.

4. Draw PQ and RS the perpendicular bisectors of XA and XB respectiely intersecting AB at Y and Z.

5. Join XY and XZ. ΔXYZ is the required triangle.

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Justification. ∵ Y lies on perpendicular bisector of AX,

∴ AY = XY

⇒ ∠XAY = ∠AXY = $\frac{1}{2}$ × 30º = 15º

Also, ∠XYZ = ∠XAY + ∠AXY

(ext.angle property)

⇒ ∠XYZ = 15º + 15º = 30º

Similarly,

∠XZY = 90º

(∵ Z lies on perpendicular bisector of BX, ∴ ZX = BZ).

Also,

XY + YZ + ZX = AY + YZ + BZ = AB = 11cm.

Ex.7 Draw a line segment PQ of length 8.4 cm. Draw the perpendicular bisector of this line segment.

Sol.
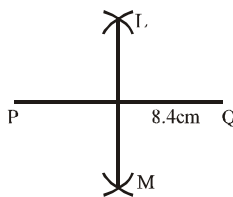
We follow the following steps for constructing the perpendicular bisector of PQ.
Steps of Construction
Step I : Draw a line segment PQ = 8.4 cm by using a graduated ruler.
Step II : With P as centre and radius more than half of PQ, draw two arcs, one on each side of PQ.
Step III : With Q as centre and the same radius as in **step II,** draw arcs cutting the arcs drawn in the previous step at L and M respectively.
Step IV : Draw the line segment with L and M as end-points.
The line segment LM is the required perpendicular bisector of PQ.

Ex.8 Using a protractor, draw an angle of measure 78°. With this angle as given, draw an angle of measure 39°.

Sol.
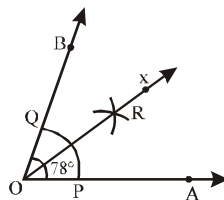
We follow the following steps to draw an angle of 39° from an angle of 78°.
Steps of Construction
Step I : Draw a ray OA as shown in fig.
Step II : With the help of a protractor construct an angle AOB of measure 78°.
Step III : With centre O and a convenient radius drawn an arc cutting sides OA and OB at P and Q respectively.

Step IV : With centre P and radius more than $\frac{1}{2}$ (PQ), drawn an arc.

Step V : With centre Q and the same radius, as in the previous step, draw another arc intersecting the arc drawn in the previous step at R.
Step VI : Join OR and produce it to form ray OX.
The angle ∠AOX so obtained is the required angle of measure 39°.
Verification : Measure ∠AOX and ∠BOX. You will find that
∠AOX = ∠BOX = 39°.

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Ex.9 Using a protractor, draw an angle of measure 128º. With this angle as given, draw an angle of measure 96º.

Sol.
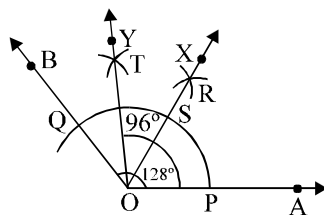
In order to construct an angle of measure 96º from an angle of measure 128º, we follow the following steps :

Steps of Construction

Step I : Draw an angle ∠AOB of measure 128º by using a protractor.

Step II : With centre O and a convenient radius draw an arc cutting OA and OB at P and Q respectively.

Steps III : With centre P and radius more than $\frac{1}{2}$(PQ), draw an arc.

Step IV : With centre Q and the same radius, as in step III, draw another arc intersecting the previously drawn arc at R.

Steps V : Join OR and produce it to form ray OX. The ∠AOX so obtained is of measure $\left(\frac{128º}{2}\right)$

i.e. 64º.

Step VI : With centre S (the point where ray OX cuts the arc (PQ) and radius more than $\frac{1}{2}$(QS),

draw an arc.

Step VII : With centre Q and the same radius, as in step VI, draw another arc intersecting the arc drawn in step VI at T.
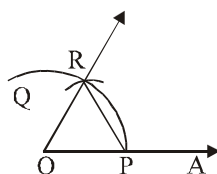
Step VIII : Join OT and produce it form OY.

Clearly, ∠XOY = $\frac{1}{2}$∠XOB = $\frac{1}{2}$(64º) = 32º.

∴ ∠AOT = ∠AOX + ∠XOY = 64º + 32º = 96º

Then, ∠AOY is the desired angle.

Verification : Measure ∠AOX,

∠XOY and ∠AOY. You will find ∠AOY = 96º.

EXERCISE – I   UNSOLVED PROBLEMS

Q.1 Take a line segment AB = 6·3 cm. Find the right bisector (perpendicular bisector) of AB.

Q.2 Construct an angle of 75° at the initial point of a given ray. Justify the construction.

Q.3 Construct △ABC in which BC = 8 cm, ∠B = 30° and AB + AC = 12 cm.

Q.4 Construct △ABC in which BC = 4.6 cm, $\angle B = 45^o$ and AB + AC = 8.2 cm. Justify your construction.

Q.5 Construct △PQR in which PQ = 5 cm, PR + QR = 7.8 cm and $\angle Q = 60^o$. Justify your construction.

Q.6 Construct △ABC such that AB = 5·8 cm, BC + CA = 7 cm and ∠B = 60°.

Q.7 Construct △ABC such that BC = 6 cm, ∠B = 45° and AC – AB = 2 cm.

Q.8 Construct a △ABC with base BC = 5.5 cm, $\angle B = 60^o$ and AB – AC = 2.5 cm. Justify your construction.

Q.9 Construct a △XYZ with XY = 8 cm, $\angle Y = 60^o$ and XZ – YZ = 2 cm. Also measure side XZ and YZ and justify your construction.

Q.10 Construct △ABC such that BC = 6 cm, ∠B = 45° and AB – AC= 3 cm.

Q.11 Construct △ABC such that ∠B = 60°, ∠C = 75° and AB + BC + CA = 13 cm.

Q.12 Construct a right triangle whose base is 6 cm and sum of its hypotenuse and the other side is 10 cm.

Q.13 Construct △ABC in which AC = 7 cm, ∠C = 60° and AB + BC = 12 cm.

Q.14 Construct a right angled triangle LMN in which $\angle M = 90^o$, base MN = 3 cm and sum of altitude LM and hypotenuse LN is 8 cm. Justify your construction.

Q.16 Construct a triangle with perimeter 12.3 cm and base angles 60° and 75°. Justify your construction.

Q.17 Construct a right angled triangle with perimeter 12 cm and one of angle of 60°. Justify your construction.

Q.18 Construct an isosceles triangle whose perimeter is 8 cm and vertical angle is 30°. Justify your construction.

Q.19 Draw a line segment AB of length 10 cm and divide of into four equal parts.

Q.20 Given an arc ABC of a circle. Locate the centre of the circle containing the arc ABc.

Q.21 Construct an angle of $11\frac{1}{4}^o$.

Q.22 Construct a triangle whose base is 6 cm and base angles are 30° and 45°.

Q.23 Construct a triangle similar to a given △XYZ with its sides equal to (3/4)th of the corresponding sides of △XYZ. Write the steps of construction.

Q.24 Construct a quadrilateral similar to a given quadrilateral ABCD with its sides (5/7)th of the corresponding sides of ABCD.

Q.25 Construct a triangle whose sides are 4.5 cm, 5.2 cm and 7.1 cm. Construct its circumcircle. Find the measurement of its radius. Also, write the steps of construction.

Q.26 Draw a triangle whose sides are 4.5 cm, 5.5 cm and 6.5 cm long and also inscribe a circle to it. Find by measurement the radius of the circle drawn. Write steps of construction.

Q.27 Construct a △ABC in which BC = 7 cm, ∠B = 60° and ∠C = 75°. Draw a circle through the vertices of △ABC.

Q.28 Construct a triangle ABC in which BC = 6 cm, ∠B = 60° and CA = 6 cm. Draw a circle touching the sides of the triangle.

EXERCISE – II — SCHOOL EXAM/BOARD

Q.1 Construct an angle whose measure is 30°.

Q.2 Construct the angle bisector of ∠A.

Q.3 Draw a line segment of length 6.4 cm and construct its perpendicular bisector.

Q.4 Construct a triangle ABC in which AB = 7cm, BC + CA = 9 cm and ∠A = 45º.

Q.5 Construct a ΔABC in which BC = 5 cm, ∠C = 60º, AC – AB = 1.5 cm.

Q.6 Construct a ΔABC whose perimeter = 10 cm, ∠B = 30º and ∠C = 60º

Q.7 Construct a ΔABC in which AB = 6m, BC = 6 cm and median AD = 4 cm.

Q.8 Construct an equilateral triangle if its altitude is 3.2 cm.

Q.9 Construct a ΔABC in which ∠B = 45º, altitude from A on BC is 3.5 cm and the median bisecting AB is 5.5 cm.

Q.10 Construct a ΔABC in which BC = 5.5 cm and the length of the perpendicular from B and C on the opposite sides are 4.5 cm and 3.5 cm respectively.

Q.11 Three sides of a triangle are in the ratio 2 : 3 : 4 and its perimter is 13.5 cm. Construct the triangle using rular and compasses only and measure the length of sides of the triangle.

Q.12 Given a quadrilateral ABCD in which AB = 6.3 cm, BC = 5.2 cm, CD = 5.6 cm, DA = 7.1 cm and ∠B = 60º. Construct a triangle equal in area to this quadrilateral.

Q.13 Construct a triangle ABC with BC = 6 cm such that ∠BAC = 60º.

Q.14 Using ruler and compass only, construct a ΔABC in which BC = 6.2 cm, ∠A = 60º and the altitude through A is 2.6 cm.

Q.15 Using ruler and compasses only, construct a ΔABC having base = 5 cm, vertical angle = 45º and altitude through A is 4 cm.

Q.16 Construct a ΔABC with AB = 4.4 cm, ∠ACB = 65º and the median through the vertex C is of length 3.2 cm.

Q.17 Construct a triangle similar to a given ΔABC such that each of its sides is (5/7)th of the corresponding sides of ΔABC. It is given that AB = 5 cm, BC = 7 cm and ∠ABC = 50º

Q.18 Construct a triangle simialr to a given ΔABC such that each of its sides is (2/3)rd of the corresponding sides of ΔABC. It is given that BC = 6 cm, ∠B = 50º and ∠C = 60º

Q.19 Draw a ΔABC in which BC = 6 cm, AB = 4cm and AC = 5 cm. Draw a triangle similar to ΔABC with its sides equal to (3/4)th of the corresponding sides of ΔABC.

Q.20 Draw a right triangle ABC in which AC = AB = 4.5 cm and ∠A = 90º. Draw a triangle similar to ΔABC with its sides equal to (5/4)th of the corresponding sides of ΔABC.

Q.21 Construct a triangle similar to ΔABC in which AB = 4.6 cm, BC = 5.1 cm, ∠A = 60º with scale factor 4 : 5.

Q.22 Construct a triangle similar to a given ΔXYZ with its sides equal to (3/4)th of the corresponding sides of ΔXYZ. Write the steps of construction.

Q.23 Construct a quadrilateral similar to a given quadrilateral ABCD with its sides (5/7)th of the corresponding sides of ABCD.

Q.24 Construct a triangle whose sides are 4.5 cm, 5.2 cm and 7.1 cm. Construct its circumcircle. Also, write the steps of construction.

Q.25 Draw a triangle whose sides are 4.5 cm, 5.5 cm and 6.5 cm long and also inscribe a circle to it. Find by measurement the radius of the circle drawn. Write steps of construction.

Q.26 Construct a ΔABC in which BC = 7 cm, ∠B = 60º and ∠C = 75º. Draw a circle through the vertices of ΔABC.

Q.27 Construct a triangle ABC in which BC = 6 cm, ∠B = 60º and CA = 6 cm. Draw a circle touching the sides of the triangle.

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EXERCISE – III — MULTIPLE CHOICE QUESTIONS

Q.1 Which of the following angles can be constructed using ruler and compass only ?
(A) 25º (B) 50º
(C) 22.5º (D) 42.5º

Q.2 Which of the following angles can be constructed using ruler and compass only ?
(A) 65º (B) 72º
(C) 80º (D) 7.5º

Q.3 Which of the following angles cannot be constructed using ruler and compass only ?
(A) 40º (B) 120º
(C) 135º (D) 7.5º

Q.4 Which of the following angles cannot be constructed using ruler and compass only ?
(A) $22\frac{1}{2}$º (B) 15º
(C) $52\frac{1}{2}$º (D) $32\frac{1}{2}$º

Q.5 The construction of a $\triangle ABC$ in which AB = 6 cm, $\angle A = 45º$ is possible when (BC + AC) is:
(A) 7cm (B) 5.8cm
(C) 5 cm (D) 4.9cm

Q.6 The construction of a $\triangle PQR$ in which QR = 5.4 cm and $\angle Q = 60º$ is not possible when (PQ + QR) is
(A) 6 cm (B) 6.5 cm
(C) 5 cm (D) 7 cm

Q.7 The construction of a $\triangle ABC$ in which AB = 7 cm, $\angle A = 75º$ is possible when (BC – AC) is equal to
(A) 7.5 cm (B) 7 cm
(C) 8 cm (D) 6.5 cm

Q.8 The construction of $\triangle ABC$ in which BC = 6 cm and $\angle B = 50º$ is not possible when (AB – AC) is equal to
(A) 5.6 cm (B) 5 cm
(C) 6 cm (D) 4.8 cm

Q.9 Is it possible to construct a triangle whose sides measure 7 cm, 5 cm and 12 cm ?
(A) Yes (B) No

Q.10 Is it possible to construct a triangle whose sides measure 6 cm, 5 cm and 10 cm ?
(A) Yes (B) No

Q.11 Is it possible to construct a $\triangle ABC$ in which BC = 5cm, $\angle B = 120º$ and $\angle C = 60º$?
(A) Yes (B) No

Q.12 Is it possible to construct a $\triangle ABC$ in which $\angle A = 60º$, $\angle B = 70º$ and $\angle C = 60º$?
(A) Yes (B) No

Q.13 Is it possible to construct an angle of 35º using ruler and compass only ?
(A) Yes (B) No

Q.14 Is it possible to construct an angle of 67.5º using ruler and compass only ?
(A) Yes (B) No

Q.15 How many cubes of side 3 cm can be cut from a cube of side 6 cm ?
(A) 2 (B) 4
(C) 6 (D) 8

Q.16 A tank 10 m × 5 m × 6 m is full of water. How much water must be taken out to reduce the water level by one metre ?
(A) 30 m^3 (B) 50 m^3
(C) 60 m^3 (D) 100 m^3

Q.17 The surface area of a cube whose volume is 343 m^3 is k cm^2 . k is :
(A) 180 (B) 360
(C) 294 (D) 394

Q.18 The length, breadth and height of a cuboid are in the ratio of 5 : 4 : 2. If the total surface area is 1216 cm^2, then its volume is :
(A) 2460 cm^3 (B) 2560 cm^3
(C) 2660 cm^3 (D) 2700 cm^3

Q.19 Find the volume of a solid cubical box, whose surface area is 600 cm^2
(A) 1200 cm^3 (B) 1100 cm^3
(C) 1000 cm^3 (D) 900 cm^3

Q.20 Two tanks are of the same capacity, the dimensions of the first tank are 12 cm × 8 cm × 4 cm. The second tank is a square with depth 6 cm. The side of the square is :
(A) 4 cm (B) 6 cm (C) 8 cm (D) 10 cm

Q.21 The curved surface of a cylinder is 264 m^2 and its volume is 924 m^3. The height of the cylinder is :
(A) 4 m   (B) 6 m
(C) 8 m   (D) 10 m

Q.22 The slant height of a right circular cone is 10 m and its height is 8 m. Find the area of its curved surface
(A) 80π m^2 (B) 60π m^2
(C) 40π m^2 (D) 30π m^2

Q.23 Find the cost of canvas required for a conical tent whose height is 16 m and diameter of base 24 m at the rate of Rs. 10 per m^2.
(A) Rs. 7543   (B) Rs. 7445
(C) Rs. 7342   (D) Rs. 7500

Q.24 The surface area of a sphere is 3424π cm^2. Find its volume
(A) 324π cm^3 (B) 648π cm^3
(C) 972π cm^3 (D) 129π cm^3

Q.25 When the radius of a sphere is doubled, the volume of the sphere becomes
(A) double   (B) four times
(C) eight times   (D) none of these

Q.26 A sphere, cylinder and cone of the dimensions radius = r, height = 2r are made. Which one has the greatest volume ?
(A) sphere   (B) cylinder
(C) cone   (D) no definite idea

Q.27 S_1, S_2 and S_3 denote respectively, the total surface area of a sphere, cylinder and cone of radius r and height 2r. Which of the following is true ?
(A) $S_1 > S_2 > S_3$ (B) $S_2 > S_1 > S_3$
(C) $S_3 > S_2 > S_1$ (D) $S_3 > S_1 > S_2$

Q.28 The volume of a sphere is 4851 cm^3. Its surface area is :
(A) 1286 cm^2 (B) 1386 cm^2
(C) 1486 cm^2 (D) none of these

Q.29 If h, S, V are respectively the height, curved surface area and volume of a cone, the value of $3\pi Vh^3 - S^2h^2 + 9V^2$ is :
(A) 0   (B) 1
(C) –1   (D) $\frac{1}{2}$

Q.30 A cone is 8.4 cm high and the radius of its base is 2.1 cm. It is melted and recast into a sphere. The radius of the sphere is :
(A) 4.2 cm   (B) 2.1 cm
(C) 2.4 cm   (D) 1.6 cm

Q.31 In a cylinder, radius is doubled and height is halved, curved surface area will be
(A) halved   (B) doubled
(C) same   (D) four times

Q.32 The volume of sphere of diameter 'r' is :
(A) $\frac{4}{3}\pi r^3$ (B) $\frac{8}{3}\pi r^3$
(C) $\frac{1}{6}\pi r^3$ (D) $\frac{1}{3}\pi r^3$

Q.33 The circumference of the base of a right circular cone is 44 cm and its slant height is 10 cm. Its curved surface area is :
(A) $\frac{220}{7}$ cm^2 (B) $\frac{200}{7}$ cm^2
(C) 200 cm^2 (D) 220 cm^2

ANSWER KEY

1.	C	2.	D	3.	A	4.	D
5.	A	6.	C	7.	D	8.	C
9.	B	10.	B	11.	B	12.	B
13.	B	14.	A	15.	D	16.	B
17.	C	18.	A	19.	C	20.	C
21.	B	22.	B	23.	A	24.	C
25.	C	26.	B	27.	B	28.	B
29.	A	30.	B	31.	B	32.	C
33.	D						

FOR SCHOOL EXAM. MULTIPLE CHOICE QUESTIONS

EXERCISE-I

1. Plot the following points in rectangular coordinate system. In which quadrant do they lie?
   (i) (4, 5)　　(ii) (4, −5)　　(iii) (−10, 2)　(iv) (−10, −2) (v) (−7, 5)　　(vi) (9, −3)
2. Plot the points (−1, 0), (1, 0), (1, 1), (0, 2), (−1, 1) and join them in order. What figure do you get?
3. The coordinates of point P are (−3, 4) and coordinates of point Q are (4, −3). Do P and Q represent same point on the cartesian plane. Give reasons for your answer.
4. Write down the coordinates of the following points A, B, C and D marked on the graph paper shown in figure _____.
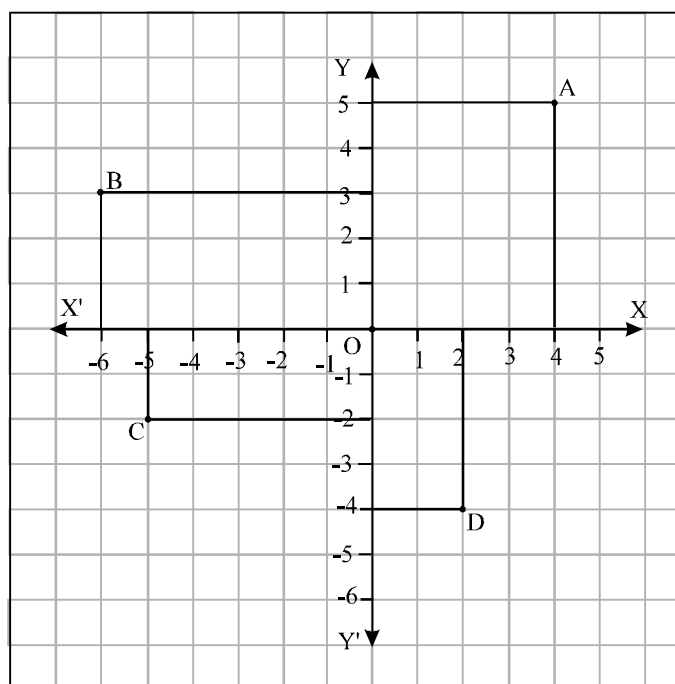
5. On which axis do the following points lie?
   (i) (7, 0)　　(ii) (0, −5)　　(iii) (0, 1)　　(iv) (−4, 0)
6. In which quadrant will the point lie. if
   (i) the ordinate is 3 and the abscissa is −4?
   (ii) the abscissa is −5 and the ordinate is −3?
   (iii) the ordinate is 4 and the abscissa is 5?
   (iv) the ordinate is 4 and the abscissa is −4?
7. Draw a parallelogram ABCD whose vertices A, B, C, D are (−4, 8), (−4, 2), (6, −5), (6, −1) respectively.
8. Construct a trapezium PQRS whose vertices P, Q, R, S are (3, 0), (7, 9), (−6, 9), (−2, 0) respectively.

EXERCISE-II

1. Draw the quadrilateral whose vertices are
   (1, 1), (2, 4), (8, 4) and (10, 1)
   What type of quadrilateral is formed by joining these points.

2. Plot the points A, B, C, D, E, F, and G from the table:

Point	A	B	C	D	E	F	G
Abscissa	7	−5	13	−4	0	0	−5
Ordinate	10	13	−5	−16	7	−5	0

   and answer the following:
   (i) Write the coordinates of A, B, C, D, E, F and G.
   (ii) Measure the length of sides AB, BC and AC.
   (iii) Shade the triangle ABC.
   (iv) Verify that AB + AC > BC.

3. Plot the points A(4, 4), B(−4, 4) and join OA, OB and BA. What figure do you obtain? Also find area of the figure so formed.

4. Determine the ratio in which the point P(m, 6) divides the join of A(−4, 3) and B(2, 8). Also, find the value of m.

5. Show that the points (1, 7), (4, 2), (−1, 1) and (−4, 4) are the vertices of a square.

6. Find the value of x such that PQ = QR, where the coordinates of P, Q and R are (6, −1), (1, 3) and (x, 8) respectively.

7. Find the distance between two points R(6, 5) and S(−4, 3).

8. The base AB of two equilateral triangles ABC and ABC' with side 2a lies along the x-axis such that the midpoint of AB is at the origin. Find the coordinates of the vertices C and C' of the triangle.

9. Do the points (3, 2), (−2, −3) and (2, 3) form a triangle. If so, name the type of triangle formed.

10. Find a relation between x and y such that the point (x, y) is equidistant from the points (7, 1) and (3, 5).

EXERCISE-III

SECTION-A

- **Multiple choice question with one correct answers**

1. The point (0, y), where y is real always lies on the
   (A) x-axis   (B) origin   (C) y-axis   (D) ordinate

2. The distance of the point (2, 0) from the origin is
   (A) 1 unit   (B) 4 units   (C) 2 units   (D) none of these

3. If coordinates of point P are (x, y) such that x < 0, y = 0, then P lies on
   (A) positive x-axis   (B) positive y-axis   (C) negative y-axis   (D) negative x-axis

4. The point (2, 3) is at a distance of _____ units from x-axis
   (A) 2 units   (B) 5 units   (C) 3 units   (D) none

5. The point (2, −3) belong to quadrant
   (A) Q_1 (B) Q_2 (C) Q_3 (D) Q_4

SECTION-B

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● **Assertion & Reason**

Instructions: In the following questions as Assertion (A) is given followed by a Reason (R). Mark your responses from the following options.

(A) Both Assertion and Reason are true and Reason is the correct explanation of 'Assertion'

(B) Both Assertion and Reason are true and Reason is not the correct explanation of 'Assertion'

(C) Assertion is true but Reason is false

(D) Assertion is false but Reason is true

1. **Assertion:** Point P(–2, 3) is at a distance of 3 units from x-axis.

   Reason: Ordinate gives the perpendicular distance of point from x-axis.

2. **Assertion:** The distance of point R(3, 4) from origin is 3 units.

   Reason: The distance between two points is given by $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

SECTION-C

● **Match the following (one to one)**

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. Only One entries of column-I may have the matching with the same entries of column-II and one entry of column-II Only one matching with entries of column-I

1. **Column I**   **Column II**

   (A) x > 0, y > 0   (P) Q_2

   (B) x < 0, y > 0   (Q) Q_1

   (C) x < 0, y < 0   (R) Q_4

   (D) x > 0, y < 0   (S) Q_3

2. **Column I**   **Column II**

   (A) x > 0, y = 0   (P) – ive x-axis

   (B) x < 0, y = 0   (Q) – ive y-axis

   (C) x = 0, y < 0   (R) + ive y-axis

   (D) x = 0, y > 0   (S) + ive x-axis

EXERCISE-IV

SECTION-A

● **Multiple choice question with one correct answers**

1. To find the abscissa of a point in the first quadrant, which of the given steps is correct:

   (A) Join the point with the x-axis

   (B) Draw perpendicular on the x-axis from the point.

   (C) Find the perpendicular distance of that point with the y-axis.

   (D) None of these

2. To locate a point (–a, –b) in the third quadrant a < 0, b < 0.

   (A) Move only in the negative direction of x-axis.

   (B) Move 'a' units in the negative direction of x-axis then b units vertically downward in the negative direction of y-axis parallel to the y-axis.

   (C) Move 'b' units along the x-axis

   (D) None of these.

3. When both the coordinates of a point are negative then the point lies in the

   (A) I quadrant   (B) II quadrant   (C) III quadrant   (D) IV quadrant

4. To find the ordinate of a point in the first quadrant.
   (A) Find the perpendicular distance of the point from the x-axis.
   (B) Find the distance of the point from the y-axis.
   (C) Find the distance of the point from the origin.
   (D) None of these.

SECTION-B

● **Multiple choice question with one or more than one correct answers**

1. If the coordintes of point A are (a, b) with ab > 0, then A lies in
   (A) I quadrant   (B) II quadrant   (C) III quadrant   (D) IV quadrant

2. Which of the following statements is/are correct.
   (A) The coordinate axes are mutually perpendicular to each other.
   (B) The y-axis is also called as ordinate.
   (C) The point of intersection of x-axis and y-axis is called as origin.
   (D) The x-axis is also called as abcissa.

3. The perpendicular distance of point P(x, y) from y-axis is known as
   (A) x coordinate   (B) ordinate   (C) y-coordinate   (D) abscissa

4. The perpendicular distance of point P(x, y) from x-axis is known as
   (A) x coordinate   (B) abscissa   (C) ordinate   (D) y coordinate

SECTION-C

● **Comprehension**

Plot the points A(−2, 0) B(2, 0), C(2, 2), D(0, 4), E(−2, 2) on the graph paper and join them in order. Now answer the following questions according to the figure obtained.

1. What is the figure obtianed by joining the points ABCDE.
   (A) square   (B) rectangle   (C) triangle   (D) pentagon

2. What is the area of the figure so formed.
   (A) 12 sq. units   (B) 8 sq. units   (C) 4 sq. units   (D) 2 sq. units

3. What is the distance of point E from x-axis.
   (A) −2 units   (B) 4 units   (C) −4 units   (D) 2 units

SECTION-D

● **Match the following (one to many)**

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the same entries of column-II and one entry of column-II may have one or more than one matching with entries of column-I

1. **Column I**   **Column II**
   (A) a > 0, b ≥ 0   (P) III quadrant
   (B) a < 0, b < 0   (Q) I quadrant
   (C) a > 0, b = 0   (R) Positive x-axis
   (D) a < 0, b ≤ 0   (S) Negative x-axis

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Answers

EXERCISE-I

1. (i) I quadrant   (ii)   IV quadrant(iii) II quadrant   (iv)   III quadrant
    (v) II quadrant   (iv)IV quadrant
2. Pentagon   3.   No
3. A(4,5), B(−6,3), C(−5,−2), D(2,−4)
4. (i) Positive x-axis (ii) Negative y axis
    (iii) Positive y-axis(iv) Negative x-axis
5. (i) I quadrant   (ii) III quadrant   (iii) I quadrant   (iv) II quadrant

4. A(4,5), B(−6,3), C(−5,−2), D(2,−4)
5. (i) Positive x-axis (ii) Negative y axis
    (iii) Positive y-axis(iv) Negative x-axis
6. (i) I quadrant   (ii) III quadrant   (iii) I quadrant   (iv) II quadrant

EXERCISE-II

1. Trapezium
2. (i) A(7,10), B(−5,13), C(13−5), D(−4,−16), E(0,7), F(0−3), G(−5,0)

    (ii) $AB = \sqrt{153}$, $BC = \sqrt{648}$, $AC = \sqrt{261}$
3. Triangle, 16 square units
4. 3 : 2, m = −2/5
6. $x = 5$
7. $\sqrt{104}$
8. $C(0,\sqrt{3}a), C'(0,-\sqrt{3}a)$
9. Scalene Triangle
10. x − y = 2

EXERCISE-III

SECTION-B

1. (C)   2. (C)   3. (D)   4. (C)   5. (D)

SECTION-C

1. (A)   2. (D)

SECTION-D

1. (A)-(Q), (B)-(P), (C)-(S), (D)-(R)
2. (A)-(S), (B)-(P), (C)-(R), (D)-(Q)

EXERCISE-IV

SECTION-A

1. (C)   2. (B)   3. (C)   4. (A)

SECTION-B

1. (A,C)   2. (A,C)   3. (A,D)   4. (C,D)

SECTION-C

1. (D)   2. (A)   3. (D)

SECTION-D

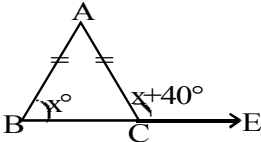1. (A)-(Q,R),(B)-(P), (C)-(R), (D)-(P,S)

EXERCISE – IV   OLYMPIAD QUESTIONS

1. The triangle formed by BC = 5 cm, AC = 3cm, AB = 5.8 cm is :-
(A) A right angled triangle   (B) An isosceles triangle
(C) An equilateral triangle   (D) An scalene triangle

2. In a $\triangle ABC$, if $AB^2 = BC^2 + AC^2$, then the rigt angle is at :-
(A) A   (B) B   (C) C   (D) None of these

3. The triangle formed by BC = 7.2 cm, AC = 6 cm and $\angle$ C = 120° is :-
(A) An acute angle triangle   (B) An obtuse triangle
(C) A right angled triangle   (D) None of these

4. The triangle formed by AB = 3 cm, BC = 4 cm, AC = 8 cm is :-
(A) A scalene triangle   (B) An isosceles triangle
(C) An equilateral triangle   (D) No triangle is formed

5. If two angles is a triangle are 65° and 85°, then the third angle is :-
(A) 30°   (B) 45°   (C) 60°   (D) 90°

6. If one angle is the average of the other two angles and the difference between the greatest and least angles is 60°, then the formed triangle is :-
(A) An isosceles triangle   (B) An equilateral triangle
(C) A right angled triangle   (D) A right angled isosceles triangle

7. In $\triangle ABC$, if AB = BC and $\angle$ B = 80° then $\angle$ C =
(A) 50°   (B) 100°   (C) 130°   (D) None of these

8. The triangle formed by BC = AC = 7.2 cm and $\angle$ C = 90° is
(A) A right angled triangle   (B) An isosceles triangle
(C) A right angled isosceles triangle   (D) No triangle is formed

9. Which of the following statement is false ?
(A) The sum of two sides of a triangle is greater than the third side
(B) In a right angled triangle hypotenuse is the longest side
(C) A, B, C are collinear if AB + BC = AC
(D) None of these

10. The length of the hypotenuse of a right angled triangle whose two legs measure 12 cm and 0.35 m is :-
(A) 37 cm   (B) 3.72 cm   (C) 0.372 cm   (D) 37 m

11. If the two legs of a right angled triangle are equal and the square of the hypotenuse is 100 then the length of each leg is :-
(A) 10   (B) $5\sqrt{2}$ (C) $10\sqrt{2}$ (D) None of these

12. Two sides of an isosceles triangle are 5 cm and 6 cm. Then the length of the third side is :-
(A) 5 cm   (B) 6 cm   (C) 5 cm or 6 cm   (D) None of these

13. In a $\triangle PQR$, PQ = PR and $\angle Q$ is twice that of $\angle P$. Then $\angle Q$ =
(A) 72°   (B) 36°   (C) 144°   (D) 108°

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14. If two sides of an isosceles triangle are 3 cm and 8 cm, then the length of the third side is :-

(A) 3 cm (B) 8 cm (C) 3 cm or 8 cm (D) None of these

15. If in a ΔABC, ∠A = 60° and AB = AC then ΔABC is :-

(A) An isosceles triangle (B) A right angled triangle

(C) An isosceles right angled triangle (D) An equilateral triangle

16. Two sides of a triangle are 7 and 10 units. Which of the following length can be the length of the third side?

(A) 19 cm (B) 17 cm (C) 13 cm (D) 3 cm

17. In a ΔABC, if AB + BC = 10 cm, BC + CA = 12 cm, CA + AB = 16 cm, then the perimeter of the triangle is :-

(A) 19 cm (B) 17 cm (C) 38 cm (D) None of these

18. In the following figure if AB = AC then find ∠ x :-

(A) 80° (B) 70°

(C) 60° (D) 110°

19. In a ΔABC, if ∠A = ∠B + ∠C then ∠A = ...

(A) 60° (B) 45° (C) 90° (D) None of these

20. If a, b and c are the sides of a triangle, then :-

(A) a − b > c (B) c > a + b (C) c = a + b (D) b < c + a

21. If the angles of a triangle are in the ratio 1 : 2 : 7 then the triangle is :-

(A) Acute angled (B) Obtuse angled

(C) Right angled (D) Right angled isosceles

22. A triangle always has :-

(A) Exactly one acture angle (B) Exactly two acute angles

(C) At least two acute angles (D) None of these

GEOMETRICAL CONSTRUCTIONS						ANSWER	KEY						EXERCISE	# 4
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	D	C	B	D	A	C	A	C	D	A	B	C	A	B	D
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**								
Ans.	C	A	B	C	D	B	C								

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